1955 REPORT
OF THE
DEPARTMENT OF AGRICULTURE

SIERRA LEONE

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REPORT OF THE DEPARTMENT OF AGRICULTURE FOR THE YEAR 1955

SECTION I—INTRODUCTION AND POLICY

The Department suffered a severe loss with the death of the Director, Mr. G. W. Lines, C.B.E., on 11th February, at Njala. He will long be remembered in the country for his vigorous policy, particularly in connection with the mechanisation of rice cultivation and extension work amongst farmers.

2. The overall staff position changed little during the year. One new Agricultural Officer arrived and one Temporary Superintendent left. On the research side the Plant Pathologist retired and a replacement arrived and one Botanist at the Rice Research Station left and two arrived. There remained six vacancies in the Agricultural Officer cadre at the end of the year.

3. Nine Sierra Leoneans continued their agricultural studies in the United Kingdom. One completed his course and returned to take up the post of Plant Pathologist. Two, who successfully completed their course at Nottingham Farm Institute, proceeded to Seale Hayne to study for the College Diploma and one started the Nottingham course.

4. The year was one of marked change amongst the local farming community in Sierra Leone. In the 1954 Report, the migration of young farmers away from farming to diamond mining was mentioned as it was becoming a factor of some importance. In 1955, due to the finding of many new alluvial diamond sites, the migration increased to such an extent that in many areas the farming economy was seriously upset; upland farms were made on a reduced scale and the production of many food and export crops decreased. In addition, the immigration of thousands of foreign West Africans to the diamond areas greatly aggravated the food problem, especially in the South-Eastern Province. There was a decline in the exports of palm kernels, palm oil and groundnuts and the rice position was also greatly affected.

5. With rice production there has been and continues to be a steady movement from upland to swamp farming as the latter is more remunerative and less arduous, once the initial work has been completed. The policy of the Department is to encourage and accelerate this movement as quickly as possibly to ensure improved land utilisation. In 1955, upland rice production suddenly decreased particularly in the Kono, Kailahun, Kenema, Bo and Tonkolili districts due to the migration of farmers. The upland crop was, however, a good one and much better than in the previous two years although total production was not up to the average of the years previous to 1953. Production of swamp rice was greater than in any previous year; the Scarcies crop was the best for many years, there was an expansion in inland swamp rice cultivation and the crop was good, also mechanical cultivation schemes markedly increased production. However, consumption greatly increased due to the rapid increase in the number of non-producing consumers in the diamond areas, both local and immigrants, as well as to greater purchasing power and a general increase in the standard of living. This resulted

in a shortage of rice and for the first time in many years a considerable quantity—21,015 tons valued at £968,018—was imported. Whilst no doubt the diamond mining will settle down over the next few years into something less than a replica of a gold rush, it seems likely that rice imports will have to continue for some time to come.

6. The exports of certain crops were little affected by diamond mining. Although the total production of piassava was slightly less than in 1954, it was about the average for the last few years. Cacao exports showed a slight increase due largely to new areas coming into production and a good crop, and ginger exports showed an increase, due largely to the increase in price. Coffee exports fell slightly due to a light crop in 1954/55 and increased local consumption, but the 1955/56 crop, which will be exported in 1956, is an exceptionally good one. Total agricultural exports decreased from 83,475 tons valued at £6,364,805 in 1954 to 70,218 tons valued at £4,588,223 in 1955, the major item being a decrease of some 10,000 tons in palm kernels.

7. Development continued on lines stated in previous years and included the mechanical cultivation of riverain swamps in the South and boliland swamps in the North for rice, the distribution and demonstration of the use of fertilizers, the planting of cacao, coffee and improved oil palm seedlings, the multiplication of pig and poultry breeding stock and the settlement of nomadic cattle owners. Other lines of work included the breeding of improved cattle at Musaia, work on cacao fermentation and investigations into the utilisation of *Lophira* bush areas. The supervision of District Council Agricultural activities and the encouragement of the formation of District Council Agricultural Sub-Committees, the distribution of improved planting material of all kinds and hatching eggs, fowls and pigs also continued. The sale of six-week old chicks was initiated and is proving popular.

8. There was a further large increase in the acreage of land cultivated under the mechanical cultivation scheme and for the first time this totalled over 10,000 acres. In the bolilands there was a marked increase in the use of superphosphates by the farmers. Considerable experimental work on new types of machinery and field trials on rice varieties and fertilizers in the bolilands was started under a Colonial Development and Welfare Scheme. Amongst machinery tested, small Garvie threshers in particular appear promising.

9. In general, the mechanical scheme is producing an economic and social revolution in hitherto remote and almost undeveloped areas. In the South, in areas where population is scarce and the main occupations were fishing, subsistance farming and small scale palm kernel production, rice farming has now become the major item, providing ample food and cash. Settlers are arriving and there are signs that these backward areas are well on their way to a new prosperity and to becoming a main rice producing centre. In the North, on the bolilands, the drift of young farmers away from the land is being halted and there is a marked increase in prosperity; upland farming on degraded areas is decreasing and farming is becoming more established and organised.

10. The Mechanical Cultivation Scheme itself is now changing from a technical to a commercial phase and a new policy to encourage this is being evolved. Mechanical cultivation in Sierra Leone will not

become an established part of the farming system if only Government owns large numbers of machines and does contract work. Only by the farmers owning machines themselves, individually or through Co-operative Societies, will this come about.

11. Cacao, coffee and oil palm planting continued on a fair scale during the year, but was rather less than in the last two years due to the migration of farmers. District Council nurseries in particular have been established to supply the demand for seedlings of these crops. There was a marked improvement in the quality of the cacao produced due to the application of better fermentation techniques.

12. The livestock population continued to increase and the number of cattle and sheep in the North are estimated to have increased by 50 per cent in the last five years. Beef was short in Freetown, largely due to the cattle owners selling their animals in the diamond areas, where prices were more remunerative and the distance to take them less. Pig keeping continued to expand particularly in the Colony area, and the only serious problem was the shortage of feeding stuffs.

13. There was an invasion of locusts, for a few days in March, in the north-eastern part of Koinadugu District. This was not serious and was the first invasion for many years, although in the 1930's this was almost an annual occurrence. Control has been largely due to an international organisation which now destroys this pest at its breeding place further north. However, the Department holds stocks of poison bait in case of a serious invasion.

14. Agricultural Shows contiuned to be encouraged and there were a number, all very successful. These are now organised on a District basis by the District Councils and the staff of the Agricultural Department assist in all ways possible.

15. Two important publications: "The Diseases of Cultivated Plants in Sierra Leone" and "A Vernacular Botanical Dictionary for Sierra Leone" were sent to the printers during the year. The Department issued the first pamphlet in its New Series: ' A Farmer's Year."

16. New development plans were under consideration during the year and a number of surveys were made and possible schemes investigated.

A—The Provision of Adequate Food for the People

17. The most important means by which this can be achieved is by encouraging the improvement and spread of swamp rice cultivation to the greatest possible extent.

(*i*) *Mangrove Swamp Reclamation:*

18. The Mangrove Clearing Loan Scheme, which was initiated by the Department in 1939, was replaced by District Council schemes in 1953. As loan repayments under the old scheme became due in instalments over a term of years, the collection of outstanding loans continued. Less than ten per cent of the original loans remained outstanding at the end of the year. In Bonthe, no further felling was carried out under District Council auspices in 1955, but 130 acres felled previously were cleared prior to renting out to farmers. Forty acres of mangrove, felled in 1954, were cleared at Yeliba in the Port Loko District. On Songo Creek, in the Colony, the Mangrove Clearing Scheme continued and some 200 acres have been felled since the scheme started; clearing of the area commenced and some trial planting was done.

19. Some felling was done by unassisted farmers in the Bonthe, Moyamba and Port Loko districts, but interest in the felling of mangrove was less than in previous years due to the movement of young farmers away to diamond mining and less arduous work.

20. Investigations into the clearing of mangrove areas by other methods than by hand have been carried out for several years. The final preliminary work carried out near Bonthe in 1955 indicated that several arboricides are effective in killing mangrove; detailed investigations into the economics of their use will be carried out at the Rice Research Station, Rokupr, in 1956.

(*ii*) *Saline Swamp Development:*

21. No further work was undertaken on the empoldering of saline swamps, and the total remains at 833 acres. A temporary halt has been made until the detailed investigational work, which is being carried out at the Rice Research Station, on these soils is completed. It is essential that there is a full understanding of all the factors involved before expanding such schemes, as they are expensive to undertake and maintain.

22. There was a considerable increase in the acreage planted with rice in the Mapotolon empolder. At Bakepet, the first complete year of allowing free tidal wash resulted in an improvement in the growth of the rice. As indicated in previous reports reclamation of saline areas, such as Bakepet, and of acid areas, such as Luti and Rosino, where there is fresh river water for a sufficient period during the year for rice growth, can be carried out by making drains to allow free tidal wash. In these areas empoldering is not essential as it is in areas such as Mapotolon, where there is no fresh river water. Trials and observations have led to these conclusions and they are of great importance, as they indicate a relatively cheap method for the reclamation of large areas of land in the Scarcies, at present unsuitable for rice growing.

23. At Fogboh, in the Colony, where there is a good demand for land, farmers continued to clear *Avicennia* mangrove and construct small polders.

(*iii*) *Inland Swamp Cultivation:*

24. Wet and dry season cultivation of inland swamps for rice and vegetable production continued to be encouraged. Demonstration and development schemes initiated by the Department, having fulfilled immediate objectives, have now been handed over either to District Councils or to the farmers themselves. In Makeni Circle, the original Departmental Swamp Clearance Schemes have been replaced by Swamp Clearance Bonus Schemes run by the District Councils, under which 415 acres have been cleared and brought into cultivation in the last two years.

25. The expansion of the cultivation of inland swamps has continued rapidly in the North and to a lesser degree elsewhere.

26. The value of superphosphate for improving rice production from inland swamps and the bolilands was further confirmed. Apart from fertilizer used on experimental and demonstration work, some 112 tons were sold to local farmers compared to 17 tons in 1954.

27. Ox ploughing continued satisfactorily in the North, mainly in the Mabole Valley, but also on an increasing scale in Koinadugu

District. Ox ploughing attains its greatest application in the long, narrow swamps, unsuited to large scale mechanical cultivation, which are plentiful in the undulating cattle country of the North. Since 1953, some seventy-two oxen have been trained and distributed in Koinadugu District.

(*iv*) *Mechanical Cultivation of Swamps:*

28. The following table shows progress to date:—

District	*Acres Ploughed*						
	1949	1950	1951	1952	1953	1954	1955
Bonthe	4	69	282	465	1,178	2,278	4,073
Scarcies (Kambia)	—	—	80	192	5	—	13
Port Loko	—	—	—	453	678	757	1,001
Pujehun	—	—	32	403	623	1,012	1,148
Moyamba	—	—	—	316	395	—	25
Makeni (Bombali)	—	—	—	238	607	1,600	1,373
Makeni (Tonkolili)	—	—	—	—	308	849	2,227
Musaia (Koinadugu)	—	—	—	30	163	127	141
Newton (Colony)	—	—	—	—	—	4	65
Total	4	69	394	2,097	3,957	6,627	10,066

29. Again the area under mechanical cultivation was increased. A certain amount of readjustment was carried out and work was stopped at a few sites where the collection of fees was difficult, also at sites which were difficult to develop due to bad communications or where flood damage was serious. New work was initiated in more favourably situated areas where the demand for mechanical cultivation was good.

30. Several roads were constructed to more remote sites with bulldozer attachments to the tractors, and work commenced on the establishment of mechanical substations at Masimo, Katonga, Torma Bum and Juring. At Batkanu and Solon the establishment of mechanical substations was completed.

31. Yields continued to be very satisfactory in most areas, and there was very little flood damage. In the Bonthe District, yields continued to average between 1,500 - 1,800 lb. per acre of paddy, whilst in the bolilands of the North, yields of up to 1,400 lb. per acre were reported where superphosphate fertilizer had been applied as advised. In the bolilands it is imperative that farmers use fertilisers and practise good husbandry if they are to be successful.

32. Many technical problems have been overcome since the inception of the scheme and much of the work is settling down to steady routine. A great deal of standardisation of equipment has been carried out, but trials with new machinery and improved techniques are continuous. The Colonial Development and Welfare grant for investigations into the potentialities of mechanical rice production in the bolilands is leading to the acquisition of a considerable amount of information and data which will guide future aspects of development of these areas. This year the use of combine seed and fertiliser drills and the harrowing-in of seed and fertiliser at planting time was developed on a larger scale than in previous years. The mechanisation of the rice harvest on the drier bolilands was demonstrated by combine harvesters; these, although technically capable, proved to be uneconomical when operating on the relatively small local rice farms. Trials indicated that further economies in

mechanical cultivation costs can be obtained by introducing wheeled tractors on certain types of land once they have been opened up with heavier machinery; this has an important bearing on the types of tractors which may be used in the future.

33. Mechanical cultivation of the riverain and the boliland grass areas has been shown to be technically feasible and the scheme has won the whole hearted enthusiasm and co-operation of the farmer. If rice production is to be maintained and increased, mechanical cultivation of the large areas of unused flooded grasslands will be one of the major factors involved. Efforts are now being concentrated on investigating the economics of the new farming techniques being evolved, methods to reduce costs and the use of new types of machinery to improve efficiency. The mechanical cultivation scheme itself has started to change from a technical, pilot scheme, phase to a commercial phase and a new policy is being introduced to allow for this.

(*v*) *Swamp Seed Rice Distribution:*

34. The West African Rice Research Station at Rokupr continued to be the main source of pure seed rice. Some 40,200 lb. were distributed from the Rokupr Farm and a further 49,800 lb. of seed rice obtained from selected farmers and re-sold throughout the country.

(*vi*) *Better Cultivation of Inland Swamps for Crops other than Rice in the Dry Season and the Development of Small Field Crops:*

35. The Horticulturist continued to encourage vegetable production in the Colony and Kabala areas. The Horticultural substation established at Kabala in 1954, proved successful during 1955 and station lay-out and building construction is well advanced. Help was given to market gardeners throughout the country by providing advice, seed and fertilisers. A most promising terracing scheme was started in the Colony hills during the year.

36. The investigations into the utilisation of *Lophira* bush areas in the Port Loko District were continued. There are indications that a general soil survey is necessary as there are several soil types on which this vegetation grows. On the soil type at Malal, results, with annual crops, remain inconclusive but the establishment of oil palms appears to be possible.

37. The dry season cultivation of sweet potatoes, cassava and vegetables in inland swamps was further encouraged and very satisfactory responses were noted, particularly in the vicinity of larger towns.

(*vii*) *Improvement of Livestock and Poultry:*

38. *Cattle.*—At Musaia, selection and breeding for an improved and early maturing beef strain of Ndama cattle continued. Strict culling of animals deficient in the requisite characteristics continued and surplus bulls were castrated either for fattening or training as draft oxen. Liaison with the Commonwealth Bureau of Animal Genetics led to a slight redesigning of records kept, but modifications were of a minor nature, and techniques used and policy followed were confirmed by the Bureau as the most suitable. The scheme for fattening cattle on the riverain grasslands in the Pujehun District was extended to the Moyamba District, again under the auspices of the local District Council. Satisfactory progress was maintained with these schemes, although suggestions have been made to the District Councils concerned on ways to improve their organisation.

39. The Cattle Owner Settlement Scheme in the Koinadugu District continued to progress satisfactorily during the year. Since the beginning of the scheme in 1953, thirty-seven areas have been surveyed, thirty-three areas have been effectively settled and four areas await settlement in 1956. Dams, with sluices, have been constructed in nearly all settlement areas and a considerable advance has been made in improving crop and animal husbandry practices and initiating simple soil and water conservation measures.

40. *Pigs.*—Newton and Njala continued to be the main pig breeding stations; work at Musaia was curtailed to allow development of other aspects of animal husbandry. The total stock again increased and some 267 pigs were sold. This year was another profitable one for pig-keepers generally and this was ably demonstrated by the commercial piggery unit established at Newton which made a net profit of £416 in its first year.

41. *Small Livestock.*—Rabbits have continued to do well and 143 were sold to local applicants for breeding purposes. New blood was introduced during the year by the importation of Flemish Giant and Giant Chinchilla bucks.

42. *Poultry.*—The deep litter system of poultry keeping once again proved its value and a steady improvement was maintained in the health and numbers of birds kept on departmental stations. The main breed continued to be Rhode Island Red, but Light Sussex chicks were imported from the United Kingdom for trial. Stocks in all stations were increased and the sale of six-week old chicks was initiated which proved very popular. Distribution to local farmers totalled 2,825 six-week old and adult birds, and 4,745 hatching eggs. In addition some 51,000 eggs were produced and mainly sold through commercial channels.

43. *Chinese Geese.*—These birds continued to thrive very satisfactorily, especially under free range conditions. Hatchability of the eggs still continues to be a problem, and is being investigated. Ten birds were sold for breeding.

44. *Muscovy Ducks.*—This breed of duck has already established itself as most suitable for conditions in this country. Stock was further multiplied on departmental stations and distribution to local farmers continued on an increased scale.

B—THE CULTIVATION OF CASH CROPS AND THE EXPLOITATION OF WILD TREES FOR EXPORT PURPOSES

45. The following table gives comparative figures of Agricultural Exports in recent years:—

Commodity	1938			1952			1953			1954			1955		
	Tons	£ *Value*	£ *Price*	*Tons*	£ *Value*	£ *Price*	*Tons*	£ *Value*	£ *Price*	*Tons*	£ *Value*	£ *Price*	*Tons*	£ *Value*	£ *Price*
Bananas	1	2	—	395	9,785	25	528	11,410	21	662	16,169	24	292	7,624	26
Beeswax	—	—	—	22	6,668	303	8	3,026	378	20	8,392	420	19	8,889	468
Benniseed	374	3,700	10	336	30,995	92	636	45,666	71	198	17,561	89	111	8,848	79
Calabar Beans ..	—	—	—	—	—	—	—	—	—	—	—	—	47	9,143	194
Cacao	384	5,849	15	2,061	638,481	309	1,631	452,923	270	1,738	802,565	462	2,177	740,829	340
Coconuts (fresh) ..	n.a.	44	—	n.a.	8,067	—	n.a.	2,506	—	104	2,445	23	25	680	27
Coffee	38	793	21	1	217	217	1,050	333,014	317	2,393	862,892	373	2,092	473,983	226
Ginger	2,705	60,680	22	1,515	169,629	111	1,859	144,702	77	1,143	162,206	141	1,733	357,320	206
Groundnuts	n.a.	5	—	2,169	182,322	84	2,686	153,000	56	1,142	64,288	56	—	2	—
Kola Nuts	1,450	29,785	20	1,242	181,009	145	1,205	136,385	113	1,379	275,545	200	1,127	212,095	188
Palm Kernels ..	63,697	457,031	7	76,375	4,675,914	61	68,904	4,259,539	61	68,080	3,763,924	55	57,640	2,509,537	43
Palm Oil	1,066	16,025	15	833	87,940	105	362	26,873	74	919	53,667	58	15	2,252	150
Pepper (Dried Red) ..	90	3,410	38	58	8,187	141	24	3,677	153	4	941	235	14	2,653	190
Piassava (Prime Sherbro)	3,751	40,369	10										582	39,189	69
Piassava (Sulima) ..				3,546	138,671	39	2,646	192,452	72	5,693	334,210	59	4,344	215,179	49
Total Value all Export		617,693			6,137,885			5,765,173			6,364,805			4,588,223	
Total Tonnage all Exports ..		73,556			88,553			81,539			83,475			70,218	

NOTE.—Figures in the above table have been revised and brought up to date in the light of most recent information and data available.

n.a.—not available.

46. The main changes in production for export were decreases in palm kernels, palm oil, piassava, coffee, kola nuts, benniseed and bananas, and increases in cacao, ginger and pepper. The movement of large numbers of the farming population away from farming to diamond mining was the main reason for the reduction in the export crops. Apart from this, the influx of large numbers of non-producing foreigners into the country, who came to mine diamonds, aggravated the shortage of many food crops. In the case of local food crops which are also exported, such as groundnuts and palm oil, these factors resulted in a cessation in exports, and, in fact, local shortages. Coffee exports fell slightly due to a light crop in 1954/55 and increased local consumption. The 1955/56 crop promises to be much heavier than that for several years. The increase in ginger production was largely due to the increase in price, and that of cacao to a good crop and new areas coming into production. Cacao is not greatly affected by mining as harvesting is during that period of the year when the alluvial mining is at its minimum, due to flooding of the areas concerned. A comparison of the actual crop production figures in 1954/55 and 1955/56 (the export figures for any year consist of part of the current year's crop and part of the last year's crop) shows an actual increase of approximately 300 tons.

47. The responsibility for raising and distributing improved varieties of oil palm seedlings continued to be largely that of the District Councils. The Department, however, continued to supervise and advise on these matters and also maintain certain large central nurseries for the production of seedlings of improved varieties. Progress during the last six years is shown in the following table:—

Oil Palm Seedling Distribution

Circle	*Number of Seedlings Distributed to Farmers*					
	1950	1951	1952	1953	1954	1955
Njala ..	6,277	4,716	16,738	15,644	6,009	4,000
S.W. Circle ..	8,604	21,600	50,565	62,215	64,300	40,100
Rokupr ..	783	3,115	9,629	600	3,317	6,319
Port Loko ..	7,775	12,118	5,772	3,523	12,124	7,706
Makeni ..	12,053	25,675	43,396	48,744	30,586	31,216
Kenema ..	—	1,190	4,900	11,515	19,561	21,801
Colony ..	4,000	12,600	14,500	3,300	12,935	14,899
Bonthe ..	—	—	615	2,790	1,898	525
Musaia ..	—	—	—	—	1,600	2,460
Total ..	39,492	81,014	146,115	148,331	152,330	129,026

48. Nearly three-quarters of a million seedlings of improved varieties of oil palm have been distributed since the campaign began in 1948. Survival rates, especially in the earlier years, were not as good as could have been wished; but with the adoption of improved planting techniques recommended by the West African Institute for Oil Palm Research, and greater care and attention in the maintenance and upkeep of young plantations by local farmers, there has been a steady improvement in establishment and survival rates. Where oil palm seedlings were correctly planted and protected by wire collars against rodent damage, losses were reduced to under 5 per cent. The lower distribution figure compared to previous years, was due to a decrease in interest in the areas mainly affected by diamond mining.

49. Work continued at Masanki Plantation in accordance with the five-year replating programme, and some 40,000 seedlings were transferred from Njala, either to Masanki nursery or to interplant between the old palms. The technique used has now been improved and sprouted seed from the Njala oil palm germinator is sent to Masanki, packed in charcoal, for nursing on raised trays prior to transplanting to nursery beds and final planting out. This system will be more economical in respect of the specially bred seed from the West African Institute for Oil Palm Research. Thirty-eight acres of new land were planted and replacements made at the Waterloo plantation.

50. Njala remained the main departmental centre for raising oil palms although, as the introduction of the technique outlined above is extended in future, the actual nursery area will progressively decrease. One hundred thousand seeds of improved varieties were again imported from the West African Institute for Oil Palm Research in Nigeria. Nurseries were also maintained at other stations and by District Councils.

51. Both coffee and cacao planting continued but on a somewhat reduced scale due to the absence of many farmers. It is noteworthy that, although there was a reduction in the world price of coffee, there was considerable planting carried out by farmers in the Northern Province due to the attractive prices on local markets where the demand is keen. There was a continued improvement in cacao quality and increasing interest and attention were paid in effecting simple control measures against Black Pod disease. Advice on the best methods of fermenting was given to farmers and co-operative societies as in previous years, and results are reflected in the steady increase in the quantity of Grade I cocoa produced. The seedlings of the Amazonian varieties of cacao obtained from the Gold Coast in 1952, continued to make satisfactory progress. A further selection of seed of F. 3 Amazonian cacao varieties, received from the Gold Coast in December, was germinated and is being nursed at Njala.

C—Soil Conservation

52. The expanding development of swamps and mechanical cultivation of riverain grasslands and the bolilands continued to afford relief to the pressure of farming on the uplands. Likewise the present trend from an agricultural to a semi-industrial economy has provided some measure of relief from land pressure problems in certain localities.

53. The early burning of grasslands, especially in the northern savannah areas, continued as in previous years. Controlled early burning was carried out under the supervision of Forestry, Local Administration and Agricultural staff. This practice ensures that there will be no late fires of great intensity, which are very damaging to tree species. At the same time early burning provides more palatable grazing throughout the greater part of the dry season and reduces the adverse effects of localised overgrazing. The long term effects of this policy are becoming more apparent each year and there are definite indications of forest regeneration in areas where previously grass was rapidly replacing forest.

54. In the Koinadugu District, the Cattle Owner Settlement Scheme gained considerably in popularity and effectiveness during the year. Dams and sluices have been constructed on most of the settlement

areas and are achieving their objectives in conserving water supplies and improving the pasture and crop production in their vicinity. At the same time considerable soil conservation has been effected by the dispersal of cattle population over a greater area with a corresponding reduction in over-grazing.

D—The Improvement in Preparation, Quality and Marketing of Produce

55. Instruction was given to farmers and co-operative societies on the correct way of preparing produce for market. Work with regard to cacao has been the most rewarding in this respect and work over the years has considerably raised the standard of quality. The market quality of coffee is improving, but it is expected that there will be a marked step forward in quality production when the Inspection and Grading of Coffee Rules, now under consideration, come into effect. The quality of piassava was once again variable but, generally speaking, better than in previous years. Departmental staff, piassava demonstrators and co-operative societies continued to give instruction and encourage improvement in quality. In certain areas, co-operative societies have set a very high standard which is having a stimulating effect on individual producers.

E—Agricultural Education

56. The training of future Agricultural Instructors at Njala Training College continued as outlined in last year's report. Eighteen students successfully completed a course of practical instruction and entered upon their first academic year, and eight students successfully completed their second and entered upon their third and final year. Twenty-two students were selected for scholarships and began the preliminary one year's practical course on major departmental farms. Visits were made by the final year students to Newton and Musaia livestock stations, the West African Rice Research Station, Rokupr, and mechanical cultivation sites and workshops within the Makeni Circle.

57. Mr. W. C. O. Allen, Agricultural Instructor, was again seconded to the Mabang Agricultural Academy during 1955.

58. Mr. H. O. Jarrett successfully completed his degree course at Glasgow University and commenced post-graduate work at the Imperial College of Science and Technology, London, preparatory to taking a higher degree in Chemistry. Mr. A. R. Siaffa having successfully completed his degree studies at Aberystwyth proceeded to Reading University to take a post-graduate diploma. Messrs. S. A. Kawa, S. A. Jabati and M. B. Alpha continued their studies at various United Kingdom univesities in preparation for their degrees. Messrs W. E. A. French and J. O. P. Davies, Agricultural Instructors, having successfully completed one year's training at Nottingham Farm Institute, proceeded to Seale Hayne Agricultural College to study for the College Diploma in Agriculture. Mr. N. A. Taylor, Agricultural Instructor, proceeded to the United Kingdom to commence his training at Nottingham Farm Institute.

F—Research

59. Details of the work carried out by the West African Rice Research Station at Rokupr are given in the Annual Report of that Station, now published separately.

60. The establishment of a substation of the West African Institute for Oil Palm Research at Njala continued and Mr. R. W. C. Galt, Research Officer on secondment from Nigeria, was in charge throughout the year. Considerable building work was carried out. The details of the work of the substation are given in the annual report of the Institute.

61. There was a change of Plant Pathologists during the year and for a considerable period work was restricted as no officer was in the post. Details are given under the appropriate section of this report.

62. The Agricultural Chemist continued fertiliser experiments, mainly on rice and groundnuts, and extended investigations on trace elements. Routine examinations of soils and feeding stuffs and investigations into crop sampling techniques were carried out. Details are given under the appropriate section of this report.

SECTION II—THE WORK OF THE DEPARTMENT OF AGRICULTURE

A—ORGANISATION AND STAFF

63. It is with the deepest regret that the death of Mr. G. W. Lines, C.B.E., Director of Agriculture, is recorded. Mr. Lines died suddenly at Njala on 11th February, very shortly before he was due to proceed on leave, prior to retirement. He came from Nigeria on transfer in 1944 and had been Director since 1951. He was promoted C.B.E. from M.B.E. in the 1955 New Year Honours.

64. Organisation remained substantially as in 1954; but with the arrival of the first of the staff for the Colonial Development and Welfare Scheme for Rice Investigation in the Bolilands, the normal staff in Makeni Circle was augmented by a Mechanical Officer and Field Officer. The headquarters of the South-western Circle were transferred from Njala to Pujehun to facilitate supervision of field work.

65. Amongst other losses to the Department were Mr. F. C. Deighton, O.B.E., Plant Pathologist, who retired during the year after twenty-nine years service in Sierra Leone and has since taken up a post at the Mycological Institute, Kew; Mr. W. Jackson, Scientific Officer, West African Rice Research Station and Mr. K. Miszewski, Temporary Agricultural Superintendent, resigned.

66. Promotions included Mr. T. N. Greeves, Deputy Director, to Director; Mr. T. S. Jones, Senior Agricultural Officer, to Deputy Director; Mr. R. M. Steven, Senior Agricultural Officer, to Principal Agricultural Officer; Messrs. J. M. Dent and H. J. Williams, Agricultural Officers, to Senior Agricultural Officers; Mr. W. MacNab, Temporary Agricultural Superintendent, to Agricultural Officer and Mr. C. A. Gabbidon, Chief Clerk, Public Works Department, to Secretary, Agricultural Department.

67. There were several new arrivals to fill vacancies. Mr. C. T. Pyne, who successfully completed his scholarship course in the United Kingdom, returned and was appointed Plant Pathologist in the vacancy caused by Mr. Deighton's retirement. Mr. F. Tait, newly-appointed Agricultural Officer, arrived in September. Dr. E. H. Roberts and Mr. R. O. Craufurd, Scientific Officers, arrived to fill the two Botanist (Plant Breeder) posts at the West African Rice Research Station, Rokupr, in September and October, respectively.

68. Despite the new appointments, several vacancies still existed at the end of the year. There were also numerous vacancies in the Junior Staff establishment, most serious being the acute shortage of trained clerical staff.

B—AGRICULTURAL CIRCLES

South-western Circle

Experimental Station, Njala:

69. The Agricultural Officer at Njala continued to be in charge of the farm. The main emphasis has been on groundnuts and yams, and mixed cropping with rice, cassava and beans. Experimentation on groundnuts followed the trend of previous years with different varieties, response to fertilisers, time of planting and continuous cropping. Multiplication of Nigerian yam varieties was carried out. The mixed cropping experiment continued with yams, beans, cassava and rice, using various fertiliser treatments. Further trials were made with legumes as cover crops. Germination methods for oil palm seeds received from Nigeria were improved. The demand for improved oil palm seedlings was considerably less than the previous year and most of the germinated seed was sent to Masanki. The extension of the new livestock buildings and the building of three piggeries was finally completed. An electric incubator was installed.

70. *Leguminous Fodders and Green Manures.—Pueraria phaseoloides* continued to be the most satisfactory fodder for the conditions at Njala. Growth and seed production were generally very good and establishment simple. *Stylosanthes gracilis* (ex Nigeria) did well throughout the year and multiplication for field trials continued. Although initially difficult to establish from cuttings, once established the crop grows well and regenerates quite rapidly after cutting. Extraction of the very small seed proved laborious and fairly expensive. Eighteen new introductions of leguminous cover crops (from French Guinea) were put under trial; only four varieties showed any promise, these were *Crotalaria astragalina, Crotalaria lanceolata, Dolichos caramcito* and *Crotalaria* (*giant*) *striata.* The more promising varieties will be tested further in 1956.

71. *Groundnuts—Time of Planting Trial.*—This was started in 1954, using the local Kono groundnut and six planting dates at fourteen days intervals from mid-April to mid-June. There was a close linear correlation between time of planting and yield. In 1955, the experiment was repeated with Kono groundnuts sown six inches apart on ridges one foot apart. Two cwt. superphosphate per acre were applied before planting. Seven replications were made for five planting dates from early April to late May. Results were as follows:—

Plot No.	*Sowing Date* 1954	*Average Yield/Acre (undecorticated)* lb.
1	8–4–54	1,065
2	22–4–54	865
3	6–5–54	535
4	20–5–54	350
5	3–6–54	260
6	17–6–54	5
7	1–7–54	Failed

Plot No.	Sowing Date	Average Yield/Acre (undecorticated)
	1955	
1	6–4–55	578
2	15–4–55	422
3	28–4–55	540
4	10–5–55	218
5	31–5–55	188

Whilst yields were poorer in 1955 than in 1954, the results confirm that early planting is essential for the best results.

72. *Groundnuts—Exhaustion Trial.*—This has been continued on one block since 1951, without application of fertiliser, to find the effect on yields of continued cropping. A steady decline in yield has been observed throughout the years, except for an unexpected peak in 1953.

Year	Dry Fruit Weight lb./Acre
1951	974
1952	512
1953	711
1954	358
1955	289

73. *Groundnuts—Variety Trials.*—Eleven varieties, introduced from Nigeria, were placed in an observation trial and uniformly treated with 2 cwt/acre of superphosphate. No variety did well and yields were below those of local Kono groundnuts grown as a control. In an experiment comparing four different indigenous varieties of groundnuts, a repeat of the experiment recorded in the previous annual report, once again Kono and Maris varieties proved much superior to the Temne and Sotina varieties, under the conditions prevailing at Njala. All trials have indicated that the Kono variety is the best variety for Njala.

74. *Yams.*—An experiment was laid down to determine the effect of fertilisers and ridge direction on the germination and yield of Chinese yams. Rice (*Oryza glaberrima*), cassava and cow peas were grown as intercrops. A very significant difference was observed between phosphate treatment and nitrogen treatment. The latter appearing to have a depressive effect on germination. No fertiliser application also resulted in low germination. Yield responses to fertilisers were similar to germination responses, and it was noted that row direction had no significant difference either on germination or yield responses. An experiment laid down comparing the relative values of capping and fertiliser treatment in yam cultivation showed that, whilst capping alone compares very favourably with fertiliser alone, a combination of both treatments gives most marked increases in yield. A continuation of the varietal experiment laid down in 1954 using White Yams and Yellow Yams, confirmed the fact that White Yams do not respond well to conditions at Njala. Comparative yields per acre were as follows:—

	1954 lb./Acre	1955 lb./Acre
Yellow yams	2,259	10,224
White yams	1,452	971

75. *Continuous Cultivation of Annual Crops.*—The method of mixed cropping introduced in 1952 continued. It is described in detail in previous reports. Briefly, this is a system whereby crops are rotated in space rather than time. After deep cultivation, ridges, four

feet apart, are planted with yams with placed fertiliser. Later, rice is sown in the furrows and, after harvesting the rice, a short term leguminous crop, such as cow peas is sown in the furrows with a top dressing of superphosphate. Vacant plot spaces are planted with cassava. The ridges are split each year, so that any residual manures are thoroughly mixed with the soil.

76. This system seemed very promising at first, but it is now apparent that yields are dropping and that soil fertility is declining in spite of the continual application of fertiliser.

TOTAL YIELDS SINCE 1952

(*In lb.*)

	Husk Rice	*Cassava*	*Yams*	*Musaia Cowpea*	*Men Fed per Year per Acre*
1952	.. 135 (Flagoi)	7,553	1,238	10	4.50
1953	.. 120 (Flagoi)	5,033	3,346	—	3.96
1954	.. 497 (Glaberrima)	3,235	1,306	56	2.75
1955	.. 483 (Glaberrima)	2,826	81	6	less than one

The yield of rice dropped slightly and the cassava yield has decreased steadily from the inception of the experiment. Despite the encouraging yam yield in 1953, subsequent yields of root crops and beans indicate that soil fertility is rapidly declining and it is expected that the yields of the 1956 crops will confirm this.

77. *Other Annual Crops.*—Fertiliser trials continued on various crops and confirmed past experience that the upland soils at Njala benefit by the application of phosphates. Fertiliser demonstration plots, using a large number of local crops, continued. In this demonstration control strips alternated with various manurial treatments. Effects of the latter could easily be seen by visiting farmers and the benefit of superphosphate, farmyard manure and compost were particularly evident.

78. *Permanent Crops.*—Recording yields of citrus, coffee and pineapples continued. A 2:2:1 mixed fertiliser treatment of individual citrus trees has now become standard practice with dry season mulching. Citrus yields continued to increase in 1955. Pruning of coffee and thinning out of shade trees was carried out and it has now been shown beyond doubt that the control of shade intensity is one of the most important aspects of coffee cultivation. Excessive shading leads to low yields. The pineapple crops have all responded to phosphatic manuring and dressings of superphosphate are now regularly applied.

79. *Oil Palm.*—The oil palm plantation and the lease at Old Njala were handed over to the Officer-in-Charge, West African Institute for Oil Palm Research substation, Njala, who is to carry out all research work on this crop. The Department now concentrates on propagating improved seed of known parentage for distribution to farmers throughout the country. Some 100,000 seeds were obtained in August from the West African Institute for Oil Palm Research, Benin, Nigeria. Setting of seed in the main germinator at Njala commenced in September and by the end of the year 41,000 seedlings had been established in nursery beds. The over-head irrigation system continued to maintain strong, healthy seedlings throughout the dry season. Some 44,000 oil palm seedlings were distributed during the year, including 40,000 seedlings to Masanki. 2,000 coffee and 947 coconut seedlings were also distributed to farmers.

80. *Cacao.*—Ten varieties of F. 3 Amazonian cacao seeds were introduced from the Gold Coast in December. The varieties were as follows:—

T. 60/F3	T. 76/F3
T. 63/F3	T. 79/F3
T. 65/F3	T. 82/F3
T. 72/F3	T. 85/F3
T. 73/F3	T. 87/F3

All seeds were germinated in raised trays with shade and over-head irrigation. Germination and growth in the early stages was satisfactory.

81. *Livestock—Cattle.*—Several deaths occurred during the year. In April, four stock died from acute gastro enteritis. The cause of death was diagnosed as being due to their consuming fermented and immature Yemane fruits (*Gmelina arborea*). In October, five more deaths occurred and, at first, Yemane fruits were again suspected to be the cause of death. Post mortem results of a carcass sent to the Veterinary Department, Teko, revealed, however, that death was due to a Salmonella infection. This was confirmed and *Salmonella chaclans* was identified. *Salmonella freetown* was isolated from an animal that died at the Njala Training College during the same period. Investigation did not reveal the source of infection, but the remaining animals received prophylactic treatment with sulphamethiazine and no further deaths occurred. Stock replacement was made from Newton and Musaia farms. Routine inoculations against Rinderpest were carried out and all young stock were inoculated with *Haemorrhagic septicaemia* vaccine.

82. *Pigs.*—The third piggery was completed during the year, and the housing problem thus finally solved. The health of the pigs was goods, but a few of the piglets suffered from *Atresi ani* and were culled. As this was most probably due to inbreeding, a new Wessex Saddleback boar was obtained from Newton. Litters continued to be rigorously culled to upgrade stock. One hundred and ten pigs were sold for breeding or slaughtered during the year and the total number of stock was slightly reduced from 110 to 103. Folding out, using an electric fence, proved most successful.

83. *Poultry.*—With the completion of the building programme and the arrival of an electrically operated Secura incubator and MacMaster brooders, the general position considerably improved. The total stock rose from 505 adults and 278 chickens to 512 and 317 respectively. Some 560 birds were sold for breeding purposes. Egg production was much more satisfactory than in previous years, and rose from 3,147 in 1954 to 7,818 in 1955. With the improved conditions, the incidence of disease diminished and, apart from an outbreak of coccidiosis amongst the young stock at the start of the rains, health was satisfactory.

84. *Muscovy Ducks.*—The flock increased from 175 to 281 birds. The policy of rearing ducklings away from the main flock, which started in 1954, continued to prove most successful.

85. *Chinese Geese.*—Results continued to be disappointing. Egg production rose during the third quarter of the year, but the proportion of infertile eggs remained very high. Investigations into this problem continued as there is a big demand for geese. The health of the flock remained good throughout the year. One pair was sold for breeding.

86. *Rabbits.*—Four bucks, two Flemish Giant and two Giant Chinchillas, were received from the United Kingdom in April, 1955. The new bucks settled down well and their introduction should lead to an improvement in body weights and litter sizes. The new rabbit room was completed but the erection of fitted hutches remains to be done. The stock number was decreased from 79 to 48 and is to be kept low pending the availability of proper accommodation. Sixty-one rabbits were sold for breeding.

Extension Work:

87. The headquarters of the circle which consists of Moyamba, Bo and Pujehun districts were transferred from Njala to Pujehun in 1955. As in the South-Eastern Circle, farming was disrupted, but to a lesser extent, by farmers leaving to mine diamonds.

88. *Inland Swamp Development.*—There was a decrease in the cultivation of inland swamps in Moyamba District and an increase in Pujehun District. Yields on the whole were above average. The approximate acreages cultivated in recent years are as follows:—

	1950	1951	1952	1953	1954	1955
	Acre	*Acre*	*Acre*	*Acre*	*Acre*	*Acre*
Pujehun ..	2,677	2,677	985	1,235	1,597	2,347
Bo ..	1,455	1,514	2,624	2,836	4,912	4,701
Moyamba ..	—	912	1,276	1,170	1,720	756
Total ..	4,132	5,112	4,885	5,241	8,229	7,804

89. *Mangrove Clearance Scheme.*—No further loans were issued by the Moyamba District Council which now runs the scheme, and efforts were directed towards the collection of outstanding loans. Small areas continued to be cleared by individual farmers, particularly in Ribbi and Bumpe chiefdoms.

90. *Mechanical Cultivation.*—The progress of the scheme is outlined below:—

Site	*Acreage Cultivated*				
	1951	1952	1953	1954	1955
PUJEHUN DISTRICT:					
Gbundapi	32	403	321	256	303
Njalunda	—	—	107	198	210.5
Panga Krim ..	—	—	—	25	17
Saama	—	—	170	130	—
Sulima	—	—	25	403	617.5
MOYAMBA DISTRICT:					
Marthyn	—	316	395	—	—
Senehun	—	—	—	—	25
Total ..	32	719	1,018	1,012	1,173

Many of the technical problems in connection with ploughing and harrowing have largely been overcome and more attention is now being paid to the organisation of stores and spare parts. Some difficulty continued to be experienced in the collection of outstanding fees and at the Saama site ploughing was discontinued for this reason. The popularity of harrowing-in of seed continues to increase, this facility being provided on a cash payment basis. Minor trials with rice varieties and fertilisers were carried out.

91. A start was made on the establishment of a mechanical substation at Juring near Sulima and a workshop was erected. A light metal prefabricated rest-house was erected at Naje near Gbundapi.

92. *Seed Rice Production.*—The demand for seed rice of improved varieties continued and the seed farms in the Bo District were maintained and extended, producing over 500 bushels of seed rice for sale to farmers. A scheme was also financed by Moyamba District Council for the distribution of seed to farmers. These schemes are serving a very useful purpose but, if they are to be a continued success, and remain economic propositions, more careful accounting and more adequate supervision must be provided by the District Councils concerned.

93. *Cacao*—The quality of the crop continued to improve although there was a tendency to over-ferment. Little cacao was planted, local interest still being in coffee despite the fall in its price. District Councils initiated plans for making planting material available and distributed 1,686 seedlings in Bo District, 17,000 in Moyamba District and 200 in Pujehun District.

94. In 1952, the Pujehun District Council started a "Cacao Loan Scheme" and has issued, to date, seventy-two loans totalling £1,681 to farmers for replanting and improving old cacao plantations in the district.

95. *Cacao Introductions.*—The introduced Amazonian cacao seedlings planted out at Futa in 1953 have grown well; 116 trees are now well established.

96. *Coffee.*—Interest in the crop continued to be marked despite the fall in the price. Large numbers of seedlings were distributed from District Council nurseries for establishing new plantations. Quality was fairly good although there is room for improvement. A number of farmers have shown interest in purchasing coffee hullers. Propaganda in the form of talks to District Councils, and demonstrations by Agricultural Instructors and demonstrators on the improvement of coffee quality were increased.

97. *Piassava.*—Production fluctuated greatly at different times of the year due to price changes. Demonstrations continued at all main centres to show the correct method of preparation. The Co-operative Societies at Sulima and Potoru increased their activities in improving the standard of production in those areas.

98. *Oil Palms.*—Demand for oil palm seedlings was not very great in 1955, and the demand was met from District Council nurseries. Farmers, generally, took more care in maintaining their plantations although there remained much room for improvement. Survival rates are still low, largely due to failure to clean brush around the seedlings and to lateness in planting out of seedlings. Distribution of seeds and seedlings was made to District Council nurseries from Masanki nursery. Distribution from District Council nurseries to individual farmers amounted to some 40,100 seedlings.

99. *Masanki Oil Palm Plantation.*—Replanting of the old existing plantation for the Produce Marketing Board continued. A new nursery was established and planted up with 12,000 extension work seedlings, *ex* West African Institute for Oil Palm Research, supplied from Njala nursery; a further 15,600 germinated extension work

seedlings from Njala were planted out in raised trays and 12,400 extension work seedlings from Njala, were used for replanting in the plantation.

100. *Cattle Fattening Scheme.*—This scheme was extended in 1955 to Moyamba District where the cows were bought at Kabala and sold after being fattened locally. There was a small profit and the scheme proved that such a proposition was economical. The Pujehun scheme showed a loss this year due to some of the twenty-three animals purchased for fattening dying from various causes. The Department has recommended to both Councils that the schemes would be much sounder, economically, if the cattle were bought earlier and slowly walked down to the fattening areas, rather than incurring relatively high lorry transport charges.

Scarcies Circle

101. *The West African Rice Research Station, Rokupr.*—This station, which is administered by the Department, now issues its own Annual Report which is published separately.

102. The circle continued to be administered by the Principal Agricultural Officer in charge of the Rice Research Station, Rokupr.

Extension Work:

103. *Swamp Development Schemes—Saline Swamps.*—The acreage of empoldered areas remained the same as last year, some 833 acres. At Bakepet, 1955 was the first year in which the water regime was completely changed from water control to tidal flooding. Following this change, there was a considerable increase in the area planted by farmers and an improvement in the growth of the rice. At Bambaia, where conditions are similar, it was recommended to the District Council that the empolder should be opened to tidal influence as at Bakepet. At Mapotolon, where rice cannot be grown without empoldering, there has been a considerable increase in planting within the empolder. Some farms on the lower lying areas again suffered from flood damage, largely due to the fact that farmers on the higher land, near the sluice, maintained the water in the drains at a high level to suit themselves. There are indications that these latter farmers may bund their own plots, retaining their own water requirements and yet allowing water to be held at lower levels in the drains, thus obviating excessive flooding of the lower areas.

104. *Inland Swamp Cultivation.*—There was a general increase in the cultivation of inland swamps in the circle. Due to the drainage work done in 1954, flooding in the Maseba Creek area has not been so pronounced this year and better crops have been obtained. Rice continued to grow well in the reclaimed swamps at Rosino and Luti and there has been considerable demand for drainage channels to be made in similar swamps.

105. *Mechanical Cultivation.*—Areas potentially useful for development by mechanical methods are the grasslands near Mapotolon, at Kassassa in Tonko Limba Chiefdom, at Mangé and along the north bank of the Little Scarcies. To date, the tidal areas of the Great Scarcies have not offered very great scope for mechanisation. Trials have been carried out at all of the above mentioned places, except Kassassa which is difficult of access. Response from farmers has been very variable in the past, with the exception of the area mentioned in the next paragraph, the chief obstacle being the fact that with

adequate production of rice, by hand, the benefit of mechanical cultivation is less apparent to farmers. Recently, however, with the increasing shortage of labour available for farm work, there has been a corresponding increase in the demand from farmers for expanded application of mechanisation.

106. Along the north bank of the Little Scarcies, mechanical cultivation was successfully established by units under the administrative control of the Agricultural Officer, Port Loko. Rice crops have done well in this area and farmers are most anxious that there should be further expansion in the immediate future.

107. At Katakera and Kichom, thirteen acres of land, belonging to six farmers, was ploughed by the small track-laying MG 5 tractor. Successful trials were also carried out with a Garvie Thresher, which proved extremely popular with farmers.

108. *Seed Rice Production.*—The Native Administration seed farms were reduced in number in 1955, and only those in Samu, Mambolo and Magbema chiefdoms were retained. No distribution will be made from the 1955 rice crops, as the latter were destroyed by rioters before harvest. During the year seed rice was distributed as usual from the West African Rice Research Station, Rokupr; 40,200 lb. of pure seed rice were distributed from the Rokupr farm and a further 49,800 lb. of seed rice from selected farms was purchased and resold throughout the country.

109. *Oil Palms.*—6,319 improved oil palm seedlings were distributed, mainly to private farmers. In general, the individual farmer's plantations continued to be better maintained and looked after than those belonging to Native Administrations.

110. *Coffee.*—The interest in coffee remained fairly constant and many farmers are establishing small plantations, mostly to supply local markets. Plantations were, generally, well maintained. The District Council nursery continued its operations and provided a nucleus of both oil palm and coffee seedlings, for distribution to interested farmers.

111. *Soil Conservation.*—As in previous years, the early burning of grassland areas was carried out by the Administration and Departmental staff. Already, regeneration of tree species is markedly superior, in early burned areas, to that in areas burnt out naturally by uncontrolled fires, at a later date in the dry season. Such fires are much more intense and result in more serious damage.

112. *Livestock.*—The few pig keepers in the circle continued to do well; as in previous years, however, most of their produce was disposed of on the Freetown market. As in other northern districts, a continued increase in the numbers of sheep was noted. There was little change in the cattle population.

Port Loko Circle

113. The work of this circle, which was established in 1952, continued to expand. Efforts continued to be directed mainly towards extension work amongst local farmers, and experimental work laid down on extension scheme sites and farmers' own crops. Field work has been mainly concerned with the mechanical cultivation of rice in the riverain areas of the Little Scarcies, investigation into the development of unused *Lophira* bush areas, distribution of oil palms, the development of pig-keeping and the more extensive use of fertilisers for increased food production.

114. Routine upkeep and maintenance of departmental offices and stores at Port Loko was carried out. At Katonga, on the Little Scarcies, a start was made on the establishment of a mechanical sub-station; a rest-house was erected and work commenced on a workshop, store and a tractor garage.

Extension Work:

115 *Mechanical Cultivation—Swamp Rice.*—The mechanical cultivation for swamp rice has progressed as follows:—

	1952	1953	1954	1955
Acreage cultivated	453	678	757	1,001

Yields obtained from the 1955 planting season were very satisfactory and compared favourably with previous years. Due to a comparatively dry wet season there was no flood damage in the Little Scarcies area and the average yield for 1955 was estimated at 1,200 lb. per acre, compared with 1,020 lb. per acre in 1954. Due to the increased crop per acre and an overall increase in production due to greater acreage ploughed, there was a tendency for the local market price of rice to fall below that of the previous year's crop.

116. In the Kasanko - Mankara area, which was one of the first sites to be mechanically developed, the cultivated area consists of two distinct types of land. Part of the area is sandy and floods only to the depth of a few inches, the remainder is peaty, has a natural vegetation of sedge and floods to a depth of 8 - 10 feet during the heaviest rains. In both 1952 and 1953, the results were very poor. In 1954, however, gaining from previous experience, the rice crop was drilled in early with a fertiliser dressing of 2 cwt. superphosphate per acre. Most satisfactory results were obtained; yields of up to 1,380 lb. per acre on the deeply flooded land and 600 - 660 lb. per acre on the shallower flooded parts were recorded. The established policy was continued in 1955 and average yields were further increased to some 1,560 lb. per acre on the deeply flooded land and 840 lb. per acre on the shallower flooded land.

117. The popularity of the mechanical cultivation scheme in this circle is assured and each year shows increasing enthusiasm amongst farmers and widespread demand for the continued expansion of the scheme to new sites.

118. *Agricultural Development of Lophira Bush Areas.*—Since 1951 experimental work and field trials have been carried out at Malal near Port Loko on an area under *Lophira* bush. There are large areas of this type of bush on the uplands in the Northern Province, and it is desirable and necessary to decide on the best use for these areas. Groundnuts appeared a possible crop and a summary of the earlier trials is given in the report for 1954. The generally low yields have been under investigation by the Chemist and results are detailed in the reports from 1952 onwards under the Chemistry section. Generally, results have been extremely varied and no fertiliser treatment has given any consistent benefit on a field scale with groundnuts. Heavy dressings of superphosphate have improved yields slightly but are not economic. Certain other elements have been shown to be beneficial in pot trials on the soils but these results have not been confirmed in field trials. In addition, groundnuts cannot be grown for more than one or two years in succession without reduction in the yields due to rosette disease.

119. In 1954 small plots of upland rice and fundi (*Digitaria exilis*) treated with superphosphate, gave encouraging results worthy of further investigation. In 1955, ten acres of upland rice (*Oryza glaberrima*) were combine-drilled with 2 cwt. per acre superphosphate. Five acres were subsequently top-dressed with sulphate of ammonia at the rate of 1 cwt. per acre. Germination was very good, but it soon became evident that the weed problem, particularly competition from the annual grass *Pennisetum subangustum* would be very serious. When harvested, an average yield of some 300 lb. per acre of paddy was recorded. The heavy weed competition was such as to preclude observation of marked differences between the area top dressed and that not so treated. In addition, four acres of fundi (*Digitaria exilis*) were broadcast in the early rains, in June, and harvested one and a-half month later. No fertiliser was applied and the yield was 357 lb. per acre, which was most satisfactory. In addition to the above, $2\frac{1}{2}$ acres were planted with oil palms. These did very well and indications are that oil palms can be established fairly easily if adequate precautions are taken against fire and rodents.

120. A rapid survey of the *Lophira* bush areas during the year indicated that several different soil types are involved and a detailed survey has been planned for 1956. This is essential to indicate if this preliminary work done at Malal can be applied generally. So far the results at Malal show that on this soil type annual crops remove fertility quickly, that fertilisers give inconsistent responses, that annual grasses cause a serious weed problem and that oil palms may be a suitable permanent crop for this area, if fire damage can be prevented.

121. *Oil Palms.*—The ten acres of Lophira bush cleared and planted during 1954 at Katonga in Loko Masama Chiefdom continued to make good growth. This area is sandy and unlike the area at Malal. Of the original 710 palms planted in July, 1954, 532 had survived at the end of that year and 521 at the end of 1955. Replacements have been made. The distribution of oil palms in recent years from District Council and Native Administration nurseries has been as follows:—

	Seedlings
1950	7,775
1951	12,118
1952	5,772
1953	3,523
1954	12,124
1955	7,706

The recommended "ball of earth" planting technique continued to be used to ensure good establishment and survival rates have been around 70 per cent.

122. *District Council Piggery—Rosint.*—Pigs to the value of £253 12*s.* 8*d.* were sold during the year. Three pigs died. Efforts continued to be made to stimulate the interest of more local farmers in pig-keeping.

123. *Mangrove Clearance.*—At Yeliba, of the 89 acres felled in 1954 by the Native Administrations, some 40 acres were cleared during 1955 and 8 acres planted. Extremely high yields have been reported from the land farmed. At Rowal, some 30 acres of the 79 cleared was taken up and planted. An encouraging increase was noted in the amount of private mangrove felling in the area adjacent to the Native Administration Clearance Scheme. The weed Kiri-kiri

(*Paspalum vaginatum*) is becoming a problem and one of the more important aspects of exploiting these reclaimed mangrove areas will be the chemical control of this weed or the provision of an alternative to hand cultivation.

South-eastern Circle

124. Seven out of nine of the graded Instructors were assigned to the three District Councils in the Province and most of their work consisted in planning and supervising District Council schemes for cacao and improved oil palm planting, increasing swamp rice farming and propaganda on the correct fermentation of cacao. Agricultural work generally was severely disrupted due to the migration of large numbers of farmers to the numerous diamond mining areas discovered in the circle.

125. *Kenema District Council Farm.*—Several quarters were erected for instructors and an old piggery was converted into a store. Some four acres of swamp were planted to produce seed rice, the oil palm plantation was maintained to produce seed and the oil palm nursery was continued, there being some 34,000 seedlings in it at the end of the year.

Extension Work:

126. *Rice.*—The increased cultivation of swamp rice continued to be encouraged and the migration of labour from traditional upland farming and poor "burns" stimulated swamp rice farming. Demonstration plots were laid down on many farms to encourage the use of superphosphate fertiliser and 26 tons of superphosphate were sold in Kenema and Kailahun districts during the planting season.

127. In Kenema District, a trial was laid down on part of the swamp on the District Council farm, which has been in continuous cultivation for 14 years, to demonstrate the effect of different applications of fertiliser and also to test four different varieties of rice. The trial consisted of 16 plots, each 1/16th acre in size; treatments were: (*a*) control, no fertiliser; (*b*) 2 cwt./acre superphosphate applied at transplanting; (*c*) 3 cwt./acre superphosphate applied at transplanting and (*d*) 2 cwt./acre superphosphate applied 3 weeks after transplanting. Varieties used were Ngasein 52, Kavunginpoothala 12, India pa lil and D. 99. Yields of paddy in lb. per acre were as follows:—

Treatment	*Ngasein* 52	*Kav.* 12	*India pa lil*	*D.* 99
(*a*)	960	960	1,522	160
(*b*)	1,056	1,248	1,960	384
(*c*)	1,120	1,928	2,232	640
(*d*)	976	1,768	2,016	248

The results indicate that superphosphate enhances yields, particularly of the longer duration rices Kavunginpoothala 12 and India pa lil on this swamp and that D. 99 appears to be an unsuitable variety here.

128. In Kailahun District a similar trial was laid down using Ngasein only. Average yields of paddy were: control—900 lb. per acre; 2 cwt. superphosphate applied at transplanting—1,737 lb. per acre; and 2 cwt. superphosphate applied 3 weeks after transplanting—2,175 lb. per acre. This swamp has been cultivated for the last eleven years.

129. *Cacao.*—The lower prices offered for coffee tended to renew interest in cacao. In Kenema District, the District Council issued £8,350 in loans to establish 334 acres of new planting. The rate per acre, £25, was considered unnecessarily high. At the request of the District Council, all prospective planting sites were inspected for suitability by departmental staff before the loans were issued. The bulk of the crop, some 2,050 tons, was produced in the Circle. The Amazon cacao introductions planted in 1953 made fair growth. Farmers continued to be encouraged to combat "Black Pod" disease by plantation hygiene.

130. Propaganda on fermentation was continued as in previous years, and, coupled with an alteration in the Grading Rules, approximately 90 per cent of the cacao marketed was Grade I. There was a tendency this year towards over-fermentation; previously under-fermentation has been the problem. The season was an early one and two-thirds of the crop was marketed in October and November.

131. *Coffee.*—Owing to the fall in price, farmers tended to neglect their plantations and new plantings on areas suitable for cacao were less numerous than in previous years. It was noted that some of the recently established plantations were being interplanted with cacao. Experimental preparation of coffee continued with a view to finding methods to improve the coffee produced, which can be passed on to farmers. Propaganda continued to prevent the harvesting of unripe cherries which is common practice at the moment.

132. *Oil Palms.*—District Council nurseries were well stocked with improved seedlings for distribution. The response by the farmers who had not left to mine for diamonds was disappointing and where they did respond, poor and late planting led to a high percentage of failures. The following seedlings were distributed from nurseries:—

Kenema District	..	5,952
Kailahun District	..	11,506
Kono District	..	4,343
		21,801

133. The Kono District Council oil palm plantations at Senehun and Worodu were maintained and consolidation was the main objective. The total acreage after discarding one or two unsatisfactory areas is approximately 120 and 35 acres respectively.

134. *Mechanical Cultivation.*—Ploughing and harrowing continued as in previous years and a total of 80 acres was intercultivated between the oil palms in the Senehun plantation. Labour was difficult and fewer farmers took up plots between the palms, most having left the area to mine for diamonds.

Bonthe Circle

Extension Work:

135. *Mangrove Swamp Reclamation.*—The Mangrove Clearing Loan Scheme started in 1939 when small loans were given to individual farmers to assist and encourage them to clear *Rhizophora* mangrove for rice cultivation. Loans were given each year until 1952, and a total of £3,165 10*s.* 0*d.* was issued to farmers during this period. The winding-up of the scheme continued and some £258 4*s.* 8*d.* remained outstanding at 31st December, 1955. During the year, £81 1*s.* 4*d.* was collected as repayment of loans.

136. In 1952, the Mangrove Loan Scheme was taken over by the Bonthe District Council. No further loans were issued, but a District Council mangrove felling team was established; this team fells, and clears, the mangrove and the Council then rents the cleared land to farmers.

137. Since 1952, some 400 acres of felling has been done by the felling team. During 1955, no new felling took place, but 130 acres were cleared, making a total of 270 acres cleared to the end of the year.

138. *Mangrove Survey.*—During the later months of the year, a survey of mangrove areas within the Circle was carried out to assess the amount of clearing and cultivation done, both with and without assistance by means of loans. It was estimated that there are now some 1,680 acres of cleared mangrove land under cultivation, with a rice production of more than 1,000 tons of paddy per year. Generally, the amount of clearance that has been done is inversely proportional to the availability of upland farming bush in a given area.

139. *Arboricide Trials for Mangrove Clearance.*—In 1953, after a visit by Professor Blackman, preliminary trials were carried out to determine whether *Rhizophora* mangrove could be killed by the application of arboricides. Various hormones were sprayed on to mangrove trunks as 2 per cent and 5 per cent solutions, with no effect.

140. Several other arboricides were made available in 1954 and a further series of trials were laid down on *Rhizophora* mangrove. It was decided to use much stronger solutions to find out, in the first instance, which arboricide, if any, would kill mangrove and also to determine the best method of application. It was found that 2, 4 - D, 2,4,5 - T and MCPA were effective in killing mangrove when applied at rates equivalent to 6 - 10 lb. of acid per acre, and that 2,4 - D was slightly more effective than the others. Ammonium Sulphamate was not effective. Painting on of the chemicals appeared to be just as satisfactory as application through slashes in the bark.

141. In 1955, a trial to test the optimum rate of application of 2,4 - D, 2,4,5 - T and MCPA required to obtain a complete kill of *Rhizophora* mangrove was laid down. Twenty-seven different treatments were applied to separate groups of five trees each. These treatments were:

Arboricide	*Strength of Application*
(*a*) 2, 4–D	.. 2, 4, 6, 8 and 10 lb. acid per acre
(*b*) 2, 4, 5–T	.. 2, 4, 6, 8 and 10 lb. acid per acre
(*c*) MCPA	.. 4, 6 and 8 lb. acid per acre
(*d*) Ammonium Sulphamate	.. 1 teaspoonful in solution per tree

In treatments (*a*), (*b*) and (*c*) the arboricide, in solution in diesel oil, was both " painted " on, and applied to "slash-cuts" on separate groups of five trees each, just above the prop-roots. In treatment (*d*), the solution was poured into an auger hole bored into each tree at an angle. Treatment (*d*) was unsuccessful. In (*a*), (*b*) and (*c*) all trees died but it was noticed that 2,4 - D and 2,4,5 - T appeared to be equally effective and slightly better than MCPA. 2,4 - D reacted more quickly and more effectively when painted on than when applied to " slash-cuts." Concentrations of 2 lb. per acre took about four months longer than those of 4 lb. per acre to be as effective; those in excess of this latter figure were not noticeably more effective. As the effects

of diesel oil alone are not known, a treatment to test this will have to be incorporated in future trials. The preliminary field trials now having been completed, work is being transferred to the Rice Research Station at Rokupr, where detailed experiments are to be carried out.

142. *Trials with Imported Rice Varieties.*—Nine varieties of recent introduction, received from the Rice Research Station, Rokupr, in 1954, were again grown on tidal mangrove swamps at Shengé Island. Several show promise. Some flood damage occurred to the $\frac{1}{4}$ acre plots and yields obtained in 1955 were calculated on areas that survived. Comparative yields were:

Variety	*Yield—lb. per Acre*		*Height of Rice at Harvest*, 1955 in inches.
	1954	1955	
C 24/102	3,067	1,581	64
HMC 19	2,960	563.5	58
Ebandioul	2,890	1,276	62
Siam	3,468	1,060	74
HR 1	1,183	2,250	49
Radin China	3,125	1,479	69
Reyon 6	1,930	1,024	69
Raminad	1,411	784	65
Elon Elon	1,874	2,721	70

143. *Mechanical Cultivation.*—Progress since the beginning of the scheme in this circle is shown in the following table:—

Year	*Acres ploughed*
1949	4
1950	69
1951	282
1952	465
1953	1,178
1954	2,278
1955	4,073

Abnormal rains from February to April tended to impede the cultivation programme, but, with nineteen tractors in the field, the satisfactory total of 4,073 acres ploughed was attained. Work done consisted of 2,346 acres cleared, 4,073 acres ploughed and 3,615 acres harrowed between mid-January and early May. The tractors used were: 1 Fowler VF. Crawler, 7 Fowler V.F.A. Crawlers and 11 Fordson Major County Tractors, fitted with Perkins P6 Diesel engines. Implements used were: Ransomes' and Massey-Harris disc ploughs, Massey-Harris Goble offset disc harrows and Ransomes' Countess disc harrows.

144. Rice yields continued to be satisfactory, averaging around 1,500 - 1,800 lb. paddy per acre. Flood damage to the rice crop was nominal and occurred only in certain restricted localities. The response of farmers continued to be extremely good and the demand for cultivated land exceeded availability. As in previous years, difficulties were experienced in moving implements and tractors on the river out to and between ploughing sites, as, in view of the limited season of work, it is essential to waste no time. During 1955, and previously, transfer of machinery was effected by pontoons, an arduous and time consuming method; the arrival of a small landing craft, now on order, should, in future, accelerate movement of machinery and alleviate many of the difficulties which lie in the way of full development of the areas concerned.

145. A mechanical substation was established at Torma Bum and a garage, workshop and rest-house constructed. The mechanical centre at Solon was enlarged by the addition of a store and extensions to garages and workshops. A permanent rest-house was built at Gbap.

146. *Fertiliser Trials.*—Superphosphate, at the rate of 2 cwt. per acre, was applied to $\frac{1}{4}$ acre plots, each with an adjacent control plot, on the Sewa River grasslands at Makita and Torma. Results were as follows:—

Site	*Variety*	*Yield—lb. Paddy per Acre*		
		Fertilised	*Control*	*Difference*
Makita	Meike ..	1,648	1,360	+288
	Meike ..	1,660	1,600	+ 60
Torma I	Mbagboli ..	1,660	1,852	−192
	Mbagboli ..	1,240	836	+404
	Average ..	1,522	1,412	+110

Previous trials on the riverain grasslands along the Kittam and the lower reaches of the Waanje River have indicated clearly that no appreciable increases in yield can be expected from fertiliser applications. This is not unexpected as these soils are naturally fertile. The results from the Sewa River grasslands indicate that these areas are also naturally fertile and that superphosphate application is likely to be doubtfully economic. However, more detailed experiments will be necessary in this area to confirm this.

147. *Piassava.*—Production during the year decreased by about 12 per cent, partly due to the migration of labour, but the Co-operative Societies continued to be popular. Propaganda continued on the best methods of preparation. Shortage of staff limited the experimental work done, but the long-term rotational cutting experiment was continued near Solon.

148. *Oil Palms.*—The District Council oil palm plantation at Gambia was increased by the planting of a further 525 seedlings, which with those planted in 1954 brings the total planted to 1,400.

149. *District Council.*—An Agricultural Superintendent and two Agricultural Instructors were assigned to Bonthe District Council. Work undertaken by the District Council included the organisation of an Agricultural Show, allocation of ploughed land and collection of ploughing fees on the mechanical cultivation sites, supervision of the mangrove clearance scheme, oil palm planting, piassava advisory work, inland swamp and creek clearance schemes.

Makeni Circle

150. Departmental work within Makeni Circle continued to be directed mainly towards the application of advisory and extension services to farmers. This work is supplemented by investigational and survey work correlating experimental results with field conditions. Liaison with the evolving District Councils, through the latter's agricultural work and staff, continued during the year. Policy regarding the agricultural activities of District Councils has been the encouragement of simple, effective services bringing the maximum benefit to as many farmers as possible within each district, best typified by the oil palm and coffee planting schemes. As in other districts, agricultural work received a set-back due to the migration of farmers to diamond mining.

151. *Inland Swamp Cultivation.*—Wet and dry season cultivation of inland swamps by individual farmers continued as firmly established practice throughout 1955. The policy of developing inland swamps for wet season production of rice and dry season vegetable growing, is of long standing.

152. Improved farming techniques were originally demonstrated by model farms and swamp development schemes. Between 1946 and 1953, 307 acres of inland swamps were cleared and utilised for demonstration and development purposes in ten chiefdoms. Apart from demonstrating correct land use, opportunity was taken at the same time to demonstrate a more advanced land tenure system, improved rice and vegetable varieties and the use of fertilisers. These previous schemes have been effective and expansion of improved farming practice has continued through the medium of Swamp Clearance Bonus Schemes. The schemes aim at assisting farmers to develop, and exploit, less accessible and denser swamps; the latter usually of higher intrinsic fertility. The bonus schemes have been organised under the auspices of the District Councils, with close liaison between departmental and District Council field staff. Under the current schemes, bonuses are paid on a sliding scale, £2 to £6 per acre, after initial inspection, assessment by departmental staff, clearance by the farmers and further inspection by departmental staff. The policy of payment in arrears has been proven as most satisfactory from experience gained. Part payment in advance, with the remainder on completion of work, has been tried and has been stopped by popular request.

Year	*Acreage Cleared*	*Average Cost per Acre*
		£ *s.* *d.*
1954	236	2 5 0
1955	179	3 11 0

These figures show a decline in acreage cleared in 1955 plus a rise in cost per acre cleared. This is an expected trend, confirming the fact that most of the more accessible swamps and those most easily cleared have already been exploited.

153. The District Council demonstration farm at Makeni continued to function but the District Council demonstration farm at Makali was closed at the end of the year. Demonstration of improved farming techniques continued to be carried out through the medium of selected "improved farmers" who are being given special attention.

154. *Ox ploughing.*—The number of farmers in the Mabole Valley area remained at 74. Several farmers purchased superphosphate fertiliser for use on their rice crops. Almost all farmers have now adopted the practice of transplanting rice on the wetter areas farmed.

155. *Mechanised Cultivation of Swamps.*—Practical exploitation of the extensive areas of boliland in this circle started in 1952. Preliminary surveys of the area have indicated a potential of over 60,000 acres. All of the bolilands are marginal with soils of medium to low fertility value, being deficient in phosphates. The fact that rice would grow under boliland conditions has long been known and there has been a very small annual production of rice under native farming methods for many years. However, production has been negligible in comparison with the possibilities of the areas involved.

156. The Rice Investigation Scheme (D 2070) was established as part of the mechanical cultivation programme of this circle, and all experimental and investigational work related to the programme is being carried out under this scheme. Such work consists mainly of obtaining accurate information and data regarding soils, water depths, heights and severity of flooding and suitable rice varieties and it will be necessary to continue it for many years to come. Survey work and record keeping are fundamental to all extension work in the bolilands.

157. The following table shows the development of the scheme in this circle since its inception:—

Site	*Acreage Ploughed*			
	1952	1953	1954	1955
BOMBALI DISTRICT:				
Bantoro (Sanda Tenranran) ..	238	417	435	375 5
Rochain „ „	—	190	301	336
Malama „ „	—	—	101	129
Mangara „ „	—	—	167	221
Rogaret „ „	—	—	209	—
Rolemre „ „	—	—	—	108.5
Fankma „ „	—	—	—	175
Mabenji (Pendembu Gowahun) ..	—	—	378	—
Private Farmers	—	—	9	30
Total ..	238	607	1,600	1,373
TONKOLILI DISTRICT:				
Masimo (Kholifa Mabang) ..	—	308	294	1,215.5
Rochen (Malal Mara)	—	—	310	608.25
Rogbinke (Mamunta Mayoso) ..	—	—	—	404
Masugbe (Malal Mara) ..	—	—	245	—
Total	—	308	849	2,227.75
GRAND TOTAL ..	238	915	2,449	3,600.75

158. Certain ploughing sites were closed in 1955, due to the excessive flood damage in the areas concerned. Overall expansion has continued at a satisfactory rate and remains well within the demand by local farmers for such cultivated land.

159. Previous experience was confirmed in 1955 that successful rice farming in the bolilands depends upon the use of superphosphate, early planting and weed control in the young crop. Farmers have continued to buy superphosphate at the subsidised price (one-third cost price) and some 112 tons were sold. Approximately one-third of the total area under cultivation was treated with this fertiliser.

160. Early rains caused a reduction in the use of seed drills at planting time. Nevertheless a substantial acreage was either drilled or cross harrowed with seed and fertiliser. Farmers are extremely enthusiastic regarding this facility, for which they pay cash. Combine harvesting, with Massey-Harris, Type 80, Rice Specials, was continued at the end of the year and into 1956. There is a demand for the services of these machines which worked well, but experience has shown that these combines are too large for the relatively small individual acreages per farmer and are thus uneconomic.

161. The use of wheeled tractors continued to be investigated. Initial work, carried out with steel wheels, did not meet with much success, but trials are to be continued with larger tractors using rubber tyred wheels, as light Ferguson tractors on rubbers were effectively used during the 1955 ploughing season for both ploughing and harrowing.

162. The constructional work at the Batkanu mechanical substation was completed. Building work was concentrated on establishing the substation at Masimo, where a rest-house, stores and garages were erected.

163. *Swamp Seed Rice Distribution.*—Assistance and advice were given to local farmers in maintaining the purity of the rice intended for seed. Distribution of selected seed of high purity was made on a small scale. General distribution of seed stocks has been taken over by the District Councils concerned, but, where feasible, applicants have been put in touch with local farmers holding reasonably pure stocks of improved varieties.

164. *Oil Palm Development Programme.*—There was a slight increase in the demand for oil palm seedlings this year. Comparative distribution figures for the past eight years are as follows:—

	Seedlings
1948	3,630
1949	4,455
1950	12,053
1951	25,675
1952	43,396
1953	48,744
1954	30,586
1955 .. .	31,216

The raising and distribution of oil palms has now been handed over in entirety to the District Councils. The centralisation of nurseries continued and has been found to be most economic and satisfactory, from the view point of supervision, at all stages from sowing to final planting out.

165. *Coffee Planting Programme.*—Considerable interest continued to be shown in the establishment of coffee plantations and District Councils have established nurseries, in conjunction with the oil palm nurseries. Some 400,000 seedlings have been distributed to farmers over the last five years. There is a good demand for coffee in the local markets, which makes the desirability of further planting independent of world market prices.

166. *Miscellaneous Crops.*—Wet and dry season cultivation of market garden crops continued to be successful and to expand on both upland and swampland. Market gardening is concentrated in the vicinity of larger provincial towns, where there is a considerable demand for fresh vegetables. The maximum use of swampland in the dry season is not yet being exploited. Growers are often tardy in moving crops into the swampland and are often five or six weeks behind demonstration gardens. Minor field crops—chilli peppers, maize, guinea corn, pigeon pea and groundnuts all gave satisfactory yields. Fresh fruit is now in adequate supply throughout the year, with seasonal gluts of individual crops.

167. *Soil Conservation and Land Use.*—The routine early burning campaign was carried out, on a chiefdom basis, in the principal grassland areas. The Agricultural and Forestry Departments

co-operated in carrying out the campaign. The effects of this campaign over a period of years are becoming more noticeable, where the burning has been correctly carried out, and in certain areas there are encouraging signs of secondary forest regeneration.

168. With the gradual development of mechanised cultivation of rice in the bolilands, the land pressure on the degenerating uplands is being relieved. Already, in the vicinity of sites under rice production for several years, there has been a very marked trend away from upland rice farming. Similarly, the trend to inland swamp farming continues to be encouraged and stimulated. With this reduction in annual farming on upland areas every effort is being made to increase the establishment of permanent or semi-permanent plantation crops in these areas. By such efforts a more stable soil economy can be achieved.

Musaia Circle

169. The headquarters of this Circle are at the Animal Husbandry Station, Musaia (until lately known as the Musaia Stock Farm), and from this centre general district extension work, including livestock extension work, is administered. The Circle comprises the Koinadugu District, in which is concentrated by far the greatest proportion of the cattle population of Sierra Leone.

Animal Husbandry Station, Musaia:

170. *Maintenance.*—Routine maintenance of the perimeter and internal fencing, gates and roads continued. Two more herd-areas were marked out on the new lease and necessary fencing erected. There were considerable modifications to the fabric of various buildings to suit present requirements. A new sluice of a modified pattern was built in the upper Kabakeya dam at the end of the dry season. This, however, was not entirely satisfactory and revealed certain weaknesses in design which will require modification. The Kamisiri dams both withstood the rains; in this swamp, however, the water level does not rise as quickly as in the Kabakeya swamp. Two flood drains were dug along the contour margins of the Kamisiri swamps, below the dam, which paid a worthwhile dividend in terms of an improved rice yield from the crop grown in the seepage area.

171. *Cattle.*—Policy continued as detailed in the Annual Report for 1953. The re-organisation of the herd was completed and animals were re-numbered by families. The records were slightly modified and re-designed on the advice of the Commonwealth Bureau of Animal Genetics. Strict culling of animals deficient in desirable conformation and characteristics continued, and surplus bulls were castrated. Culled beasts were fattened and disposed of by sale. Certain bullocks were trained and sold for use as draught oxen.

172. No change was introduced in the breeding policy, which aims at producing an earlier maturing strain of Ndama cattle. Bulls were run with breeding herds in Herd Areas I, II, III and IV during the months of July and August. Fifty-seven calves were born in the course of the year, compared with sixty-one calves during 1954. The average birth weight of the calves showed a slight decrease, 35.5 lb. compared with 37.3 lb. in 1954; this can be attributed to the large number of first calf heifers which calved in 1955, whose calves tend to be light, and the fact that one bull used during 1954 was later found to be substandard; this has been culled. The question as to

whether the birth weight of a calf has any bearing on its subsequent performance is at present under investigation. All breeding cows and heifers were pregnancy-tested by the Veterinary Officer, before the end of the year.

173. *Cattle Diseases.*—Routine inoculations against Anthrax, Blackquarter and Rinderpest were carried out early in the year. The outbreak of Contagious Abortion now seems to be under control and only four abortions occurred during the year. All breeding cows and heifers were inoculated with "S.19" against *Brucella abortus* at the end of June. "Minel" was administered at the beginning of April, July and October. One of the breeding bulls (B. 33) died, and another (179) was killed for post mortem examination by the Director of Veterinary Services. Suspected cause of death was worm infestation. Six out of a batch of ten yearling heifers, grazing an acre paddock of *Axonopus*, died suddenly; a seventh was killed for post-mortem examination by the Director of Veterinary Services, but this did not reveal any predisposing causes. Seven calves were lost, indications being that leopards had taken them.

174. *Pigs.*—The head of stock was reduced during the year due to the limited local demand for breeding stock. Health was quite good and Antrycide prosalt was administered at ten-weekly intervals.

175. *Poultry.*—An outbreak of fowlpox, and feeding, were the main problems during the year. The local demand remains keen, but distribution has been restricted to selected farmers. Inoculations against Newcastle disease and fowlpox were carried out.

176. *Rice.*—Forty-seven acres of rice were grown on the station, in swamps in herd areas, and on the Mongo riverain grasslands. Yields continued to be fair to good in most swamps, but the Mongo area was again disappointing as the river did not flood until October, which is very late in this area. Hippopotami, from Mongo River, continued to be troublesome.

177. *Grasses and Forage Legumes.*—Work continued to be directed towards finding fodder crops which will provide grazing in the dry season under natural conditions. Due to the shortage of staff, progress has been slow and confined to investigating the performance of *Axonopus africanus, Pueraria* and *Stylosanthes gracilis.* The results of work on *Axonopus africanus* continued to indicate that it is only suitable on low lying ground. An undersown crop with upland rice failed to establish, due to poor germination. Regeneration after fire was more promising, but *Axonopus*, although recovering quite rapidly, could not compete with *Chasmopodium.* Grazing trials on the uplands have shown that, after about three years, *Axonopus* tends to be crowded out by *Pennisetum subangustum* and *Chasmopodium. Pueraria* continued to do well, both germination and establishment being very satisfactory. Certain long established plots failed to set seed this year, probably due to adverse climatic conditions at flowering. The *Stylosanthes gracilis* area was extended, but cattle do not graze it well, until they are used to it, due to the spiky leaf tips.

178. *Cattle Owner Settlement Scheme.*—This started in 1953 in co-operation with the Koinadugu District Council; its aim being to encourage the settlement of the nomadic cattle owners. Details are given in the 1954 Annual Report. In 1953, seventeen settlement areas, each of one square mile, were surveyed and fourteen were occupied.

In 1954, a further nineteen were surveyed for settlement in 1955. In 1955, four more areas were surveyed, three areas, previously surveyed, were discarded, as being not entirely suitable, and nineteen areas were occupied. Thus the present position is that thirty-seven areas have been surveyed of which thirty-three areas are occupied Fifteen dams, with sluices, were constructed in the newer settlement areas. The sluices were all of improved design, but these are not yet entirely satisfactory and investigation into further improvement of design continues. To avoid misunderstanding, and to obviate boundary disputes, all boundaries were marked every 200 yards with concrete beacons, interspersed with yemane trees (*Gmelina arborea*). Within the settlements, efforts have been intensified to introduce improved farming techniques and to effect simple soil conservation measures. Swamp areas have been established for rice production, and oil palm and coffee plantations have been established on upland areas, where *Pueraria* strips have also been established. Several narrow gullies, present before settlement started, were closed during the year; these gullies were accelerating erosion and were a problem to the cattle owners who had lost cattle in them. The scheme, as a whole, has the confidence of the Fulas and Yalunkas, and the present demand for settlement areas exceeds the possible rate of settlement. Progress to date has been most encouraging.

179. *Mechanical Cultivation and Ox Ploughing.*—Oxen are more suitable sources of motive power than tractors in the long, narrow, inland swamps of the Koinadugu District. Since the beginning of the ox ploughing scheme in this district in 1953, some seventy-two oxen have been trained and sold to interested farmers through the Koinadugu District Council. Interest in the scheme continues to increase amongst the Yalunkas, Kurankos and Fulas. Although the application of mechanical cultivation is somewhat restricted, due to topographical difficulties, the interest and demand remains high. During the 1955 ploughing season, 141 acres were cultivated by tractors, on contract for farmers.

180. *Distribution of Planting Material.*—A new oil palm and coffee seedling nursery was started at Falaba and a site for another was selected at Mongo Bendugu, to be opened in 1956. The distribution of oil palm, coconut and coffee seedlings and pineapple suckers from the District Council farm at Kabala and nurseries at Fadugu and Bafodea continued. The demand for planting material remains brisk, due to the shortage of economic trees generally in the district. Citrus and other fruit tree seedlings were distributed from the Horticultural substation, Kabala, and coffee seedling distribution was supplemented from stocks from Musaia and Makeni Departmental stations.

181. *Locusts.*—A swarm of Desert locusts, *Schistocerea gregaria,* invaded the Gberia Futumbu area, near the north-eastern border, early in March. They did little damage and moved back into French Guinea after a few days.

Colony Circle

182. The headquarters of this Circle is at Newton, where there is an experimental and livestock breeding station. The soil on the station is typical of the undulating lands of the eastern Colony, containing a high proportion of fine sand, and is of low natural fertility. The conservation and improvement of soil fertility is a major problem in this Circle, where the inherently poor soil has been further

impoverished by high rainfall and overfarming. Land utilisation, in connection with this programme of conserving the soil, is equally important, as the naturally richer pockets of land, in the inland and tidal swamps, must play a major part in relieving the pressure of farming on the upland. Apart from the mountainous area, a considerable part of which is under forest reserve, and the saline mangrove swamps, the vegetation is low bush, coarse grasses, predominantly *Chasmopodium caudatum* and *Imperata cylindrica,* and oil palms.

Experimental Station, Newton:

183. *Livestock—Cattle.*—The Ndama herd now consists of one bull, eleven cows and followers, giving an average of some twenty head of stock. This herd, which is of a suitable size for the grazing available on the farm, is vigorous and prolific due to rigorous culling over many years. Cows are milked in the morning and turned out with the rest of the herd into grass paddocks during daylight. The calves are allowed to suckle their dams whilst on free range. The cattle are returned to a covered yard each night and the calves segregated. This routine is practised throughout the year, although it is occasionally necessary to supplement the grazing in March and April. The health of the adult stock was excellent throughout the year. Four calves died from unknown causes and post-mortem findings were inconclusive.

184. *Pigs.*—The past year was another good one for pigs, despite a very severe shortage of food in the first half of the year. It was another record year for production and twenty-two Large White and sixteen Wessex Saddleback litters were born.

	Large White				*Wessex Saddleback*			
	1952	1953	1954	1955	1952	1953	1954	1955
Number born	9.3	8.4	8.5	8.8	6.3	7.0	7.8	7.7
Number reared	6.6	7.0	6.0	5.7	4.5	4.5	6.5	6.1

Average numbers reared were slightly lower than in 1954 due to six cases of abortion and more rigorous culling of the litters at birth. The number of stock increased from 128 at the end of 1954 to 194 at the end of 1955, largely due to the establishment of the commercial piggery. During the year, 68 pigs were sold for breeding and 89 for slaughter.

185. Trypanosomiasis caused most of the deaths among the pigs during 1955, and was the suspected cause of the six cases of abortion. There were also six deaths from suspected inflammation of the brain, the cause of which is unknown. Apart from these cases the pigs remained very healthy. Routine inoculation with Antrycide prosalt against trypanosomiasis was regularly carried out by the Veterinary Department. The latter department is investigating the possibility of the abortions being linked with latent trypanosomiasis, or, alternatively, being caused by a secondary infection once the health of the animal has been lowered, due to attacks by tsetse fly.

186. *Commercial Piggery.* This year saw the start of a small commercial piggery unit. The object of this is to demonstrate to local small holders, the practical economics of pigkeeping, using

improved stock and up-to-date methods of housing, feeding and management. The unit consists of nine sows and gilts and their progeny and is run by one man. At the end of the year the unit showed a net profit of £416.

187. *Poultry.*—The principal breed kept at Newton is the Rhode Island Red, which was first introduced into Sierra Leone on any scale in 1940. In the early years many died from fowl pest, typhoid, fowl-pox and coccidiosis.

188. Gradual improvement in management, general hygiene, feeding, and the increased used of prophylactics, have successfully reduced mortality and improved the health and fertility of the adult stock. To ensure a constant influx of new blood and to obviate inbreeding problems, the policy of importing batches of day-old chicks has been followed for several years now. There was some difficulty in obtaining sufficient locally produced food during the year. Routine inoculations against fowl-pox and immunisation against Newcastle disease continued.

189. Egg production trials with the deep litter system were started in 1953, and, in 1954, a small experimental battery unit was also established. Results were very satisfactory, compared to free range, under both systems. A yearly average of 113 eggs per bird was produced in the deep litter house, and 183 eggs per bird in the battery unit.

190. The Rhode Island Red stock at the end of the year had been increased to 2,095 from 1,320 at the end of 1954. There were, in addition, 45 Light Sussex birds. A total of 48,466 eggs were produced compared to 33,795 in 1954; 14,390 were incubated, 3,921 sold for hatching and the surplus disposed of through commercial channels. Some 2,265 six-week old chicks and adult birds were sold for breeding compared with 549 in 1954.

191. *Muscovy Ducks.*—These, which suit the local conditions extremely well, continued to be multiplied for local distribution and 239 were sold, compared with 127 in 1954. In previous years Khaki Campbell and Indian Runner ducks were also bred at Newton but these two breeds did not prove successful under local conditions. The ducks do not receive any food during the rains, but are left to forage for themselves. Some supplementary feeding with a mixture of cassava, rice bran, broken rice and groundnut cake is given during the dry season. No special housing conditions are provided and all that is required is a dry floor with a good roof. No side protection to the building has been found necessary, except against the prevailing wind during the rains. The birds require very little attention at any time and remain very healthy indeed. Only at hatching-out time is any special attention given to the young stock; these are removed from the mother twenty-four hours after hatching and are reared in a brooder until strongly feathered on the back.

192. *Chinese Geese.*—The flock of geese continued to remain healthy under free range conditions; this system had an adverse effect on the paddocks, however, as the close selective grazing habits of the geese caused rapid deterioration of the grass. Fertility and hatchability of the eggs remained low and is being investigated.

193. *Rabbits.*—Rabbits continued to do well and local demand remained high. Eighty-two were sold for breeding and stock at the end of the year totalled one hundred.

194. *Tree Crops.*—Oil palms, avocado pears and citrus continued to yield satisfactorily. Replacement of older trees was carried out in the mixed fruit plantations.

195. *Annual Crops.*—Twenty-eight different leguminous cover crop *ex* French Guinea, were sown to provide seed for larger scale planting in 1956.

196. Rotational cropping of degraded upland soil continued with reasonable success. There are indications that fertility can be maintained by heavy manuring and ploughing in of cover crops on this type of soil. *Stylosanthes gracilis* gave excellent cover, smothering out indigenous weeds and grasses and remaining green and palatable until mid-February.

197. *Chinese Yams.*—Trials with Chinese yams were continued. Conclusions, based on trials carried out between 1953 and 1955, are that (*a*) yields are directly proportional to the amount of farmyard manure applied, (*b*) early planting enhances yields, and is essential to obtain heavy yields, (c) "capping" generally increases yields, especially if combined with early planting.

198. *Fertiliser Demonstrations.*—The visual demonstration was continued for the benefit of visiting farmers. Differences in growth responses varied from crop to crop, but were not so marked as in previous years. In every instance, treated plots showed an increase in yield over controls.

Extension Work:

199. *Rice Swamp Development.*—In the degraded and over-farmed Colony area development of all the available swamps is of primary importance. Development at Maswari started with an experimental polder of 3 acres constructed in 1938. In 1942, this was extended to 10 acres and in 1945, a new polder of 75 acres was constructed. A further area of 90 acres was cleared and poldered in 1952 and 1953. Of the total area of 175 acres, 92 acres were cultivated in 1955, the remainder being land in the most recent polder which is still rather too saline for rice. Yields continued to be good, averaging about 1,300 lb. paddy per acre, with some farmers harvesting up to 1,680 lb. The few plots with poor yields could be traced to bad husbandry, mainly late planting. The departmental 4-acre polder gave an average yield of 1,320 lb. paddy per acre.

200. At Fogboh, where there is a good demand for land, farmers continued to expand the area under cultivation by clearing *Avicennia* mangrove and constructing small polders. At Songo Creek, farmers continued felling *Rhizophora* mangrove and it is estimated that a total of over 200 acres have been felled since the scheme started. Clearing of the area commenced and some trial planting was done.

201. No further clearing of inland swamps was carried on at Kotopema or Campbell Town, where a total of 97 acres was cleared under the original scheme. Some 48 acres of this was planted in 1955. The response of local farmers to taking up plots has been disappointing; in this area they prefer to hire labour rather than do the work themselves.

202. *Waterloo Oil Palm Plantation.*—The establishment of a plantation of 1,000 acres on the Old Waterloo airfield at Kissi Town was started in 1949. The main difficulty encountered has been accidental fires, but rodents have caused heavy losses at times,

Consolidation of the area already planted was the main object during the year. By regular brushing of fire traces, the use of wire collars round seedlings, to prevent rodent damage, and interplanting of the palms with cassava, to restrict both fires and rodent damage, a more satisfactory state of control has been reached. The use of wire netting collars is a highly effective measure, and, out of a total of 4,326 so protected, only ten seedlings were destroyed by rodents. Further precautions against fire were taken by cleaning between the rows of oil palms with heavy duty disc harrows at the beginning of the dry season. This measure was successful and, unlike previous years, no fires spread through the plantation this year. A portion of the 1951 planted area, which had been abandoned because of too frequent outbreaks of fire, was re-opened and re-established with 8,002 seedlings. A new area of 38 acres was planted. Fruit was harvested for the first time—834 heads weighing 2,278 lb. Interplanting by local farmers was again encouraged, and over 70 acres were planted up with cassava and other short duration crops by them.

203. Distribution of oil palm seedlings from Waterloo Plantation nursery over the last few years has been as follows:—

	Seedlings
1950	4,000
1951	12,600
1952	14,500
1953	3,300
1954	12,935
1955	14,899

These seedlings were distributed through the Rural Area Council to local farmers. In addition, some 12,806 seedlings were used during 1955 for replacement and establishment in the plantation.

204. *Coffee.*—7,745 Robusta coffee seedlings were distributed during the year from the Rural Area Council nursery, which is sited on Newton experimental station.

C—HORTICULTURAL SECTION

205. The work in this section continued to be directed towards increasing the quantity and improving the quality of vegetables and fruit produced, both in Freetown and the Provinces. Soil conservation by terracing, the provision of seeds, fertilisers and planting material, and advice as to their use, have formed the basis of extension work. Experimental work on local horticultural problems, including trials with new varieties of seeds, continued, as well as trials with new types of horticultural machinery.

206. The effect of this section of the Department, which only started in 1951, has been marked. The standard of market gardening has risen appreciably, a good supply of vegetables is now normally seen in the Freetown markets and there has been a general improvement and increasing interest in gardening generally. The demand for planting materials again increased.

207. *New England Horticultural Station.*—This Station, close to Freetown, is the headquarters of the section. Trials of new varieties, fertilisers and pest control methods continued. Frequent visitors to the station included school parties, and demonstrations were arranged for them. A new store and garage were erected and a propagation frame, with a "constant mist" system of irrigation, was installed in the plant house. Terrace walls were erected to conserve the soil and the collection of specimen trees was increased by new introductions.

208. *Lumley Horticultural Sub-station.*—This continued mainly as a propagation centre for economic and ornamental seedlings. Experimental work continued on tomatoes, fertilisers and new introductions of vegetables. A start was made on the construction of a new permanent plant house.

209. *Pigs and Poultry.*—Routine work continued. Visitors to the Lumley substation took a keen interest in what proves to be a useful demonstration for local stock keepers, as well as providing manure for the vegetable garden.

210. *Gloucester Demonstration Garden.*—This garden, taken on a short lease in 1952 as an advisory and demonstration centre, was closed during the year, its purpose having been fulfilled. The standard of market gardening at Gloucester and Leicester has greatly improved and regular visits by Departmental Advisory Staff, now that the road to Freetown has been improved, serve this area.

211. *Regent Rural Area Council Nursery.*—This nursery, started in 1952 to demonstrate improved methods of vegetable gardening in the mountain area, and for the propagation of fruit trees, continued to function. Irrigation and terracing was extended and the terraces were planted with fruit trees. The "advisory bureau" building continued to function and sales of fertilisers and seeds were considerable. Periodical visits were paid by the staff to gardens in the area to advise and help with the control of pests.

212. Vegetable varieties which were particularly successful were beans, "Kentucky Wonder"; lettuce, "Majestic," "New York" and "Great Lake"; carrots, "Oxheart" and "Early Nantes"; tomatoes, "Italian Plum" and "Las Palmas"; cabbage, "Copenhagen Market" and "Sure-head"; parsley, "Double Curled" and sweet pepper "Chinese Giant."

213. A small mechanical water pump was installed to reduce labour in watering the higher terraces. The use of a semi-rotary pump has initiated a demand for these pumps amongst local vegetable growers.

214. *Kabala Horticultural Substation.*—This substation was started in 1954 in the North of the country, in an area where there are good potentialities for market gardening. During the year the construction of a combined office and store commenced and the establishment of the station was nearly completed. The layout of the vegetable section was completed, an irrigation system installed and the fruit section was cleared and stumped and economic trees planted. A large number of stock citrus seedlings were planted for budding in 1956, and other seeds and cuttings planted for eventual distribution. The cultivation of onions, cabbages and tomatoes was made a special feature in the vegetable section, as these do particularly well in this area. Sweet corn, beans and garden eggs were also grown on an appreciable scale to demonstrate the cultivation of vegetable crops, which are not immediately perishable, which may be sent long distances. The difficulty of transport of crops from this centre to urban areas is a particular problem. Local growers were advised on improved techniques and many visited the station. A considerable quantity of vegetable seed was harvested on the station for distribution.

215. Trials were carried out with a Howard "Yeoman" rotary cultivator, a "Munro tiller" and a new type of American irrigation

nozzle. Watering was satisfactory on permanent crops but not for vegetable seedlings, which were damaged, or washed out, owing to the coarseness of the spray.

216. *Distribution of Planting Material.*—The propagation of economic seedlings, mainly citrus, continued. A total of 4,244 economic seedlings, were distributed by this section compared with 3,898 in 1954; 1,599 in 1953 and 796 in 1952. The distribution of ornamentals also continued and, excluding cuttings, totalled 6,760 against 1,970 in 1954, 870 in 1953 and 460 in 1952. There was a great demand for seedlings and rooted cuttings of all types.

217. *Distribution of Vegetable Seeds.*—The demand continued to increase, despite the fact that some local firms now supply seeds, and many established farmers also import their own. Considerable quantities were distributed free to schools as well as sold to local growers. All varieties distributed were those which have been tested and shown to do well under local conditions.

218. *Introduction of Plants.*—Amongst a considerable number of new plants introduced were dwarf coconuts from Fiji and several varieties of mandarin, tangelo, lime and mango from French Guinea, A large collection of cover crops was introduced from French Guinea, also seven varieties of paw-paw from America. Some 40 new species of ornamentals were introduced from various sources. Other introductions of special interest were *Pachira macrocarpa* from French Guinea and *Faxinus* sp. (Tropical Ash) from Puerto Rico.

219. *Experimental Work.*—Work continued on possible control methods of Bacterial Wilt of tomatoes, which is becoming a serious disease in some areas. The most effective method so far found has been sterilisation of the soil of infected beds to a depth of eight inches at 210° F. for one and a half hours. This gave complete control throughout the life of the following crop. Trials continued on various new introductions of vegetables and fourteen varieties, out of many tested, grew well and were added to the list of varieties recommended for local cultivation.

220. *Extension Work.*—Agricultural Instructors in this section combine district work with the supervision of demonstration nurseries, or substations, thus ensuring that such staff take a practical interest in the problems of the growers and providing the liaison essential for advisory work. One instructor was posted to the Provinces during the year to make contacts in the larger towns, to extend the distribution and sale of seeds and fertilisers to local growers and to take over work at schools. Routine work included laying out demonstrations in growers' own gardens to show advantages of fertilisers, improved seeds, insecticides and modern methods of cultivation.

221. *Terracing Scheme.*—A new scheme was introduced during the year to demonstrate and encourage terracing in the mountain area of the Colony, for vegetable growing in particular. A small group of trained staff visited the farms of applicants, laid out contour lines and constructed a few demonstration stone terraces. This was only done on the condition that applicants continued the work. There was a good response and some 19 farms were visited and work initiated. A considerable number of new applicants have applied for similar help in 1956.

222. *Horticultural Show.*—The fourth Annual Horticultural Show was held at Hastings on 6th April and was well attended. There were a very large number of entries, particularly in the fruit section, and this year's entries from the Colony schools were very much in evidence, which augurs well for the future. The Show was sponsored by the Agricultural Department and the Rural Areas Council with financial assistance from the Produce Marketing Board.

223. *Technical Propaganda.*—The Horticulturist and staff continued to give talks, lectures and demonstrations to schools and other organisations interested in gardening. The Horticulturist gave a monthly series of broadcasts on general horticultural subjects entitled "Horticultural Commentary." This series included advice on the layout of fruit and vegetable gardens, the cultivation of popular fruits and vegetables, pest and disease control methods, also general information on the progress of horticulture in Sierra Leone. Films were obtained and shown by the Public Relations Department throughout the country, particularly at Agricultural Shows. The Horticultural section supplied technical exhibits at several District Agricultural Shows during the year.

224. The series of pamphlets, started some years ago, "Horticultural Notes," was extended and large numbers were distributed. These notes are of a simple technical nature designed to improve the knowledge of growers. The series so far consists of:—

No. 1 Storage of seeds in the tropics.
No. 2 The planting and transplanting of fruit trees and shrubs.
No. 3 Tomato cultivation in Sierra Leone.
No. 4 The utilisation of vegetable refuse in the garden.
No. 5 The planting, pruning and care of citrus trees.
No. 6 Vegetable varieties suitable for Sierra Leone.
No. 7 Fertilisers and their use in the garden.
No. 8 The cultivation of onions in Sierra Leone.
No. 9 Insect pests and their control in the garden.
No. 10 The cultivation of herbs in Sierra Leone.
No. 11 The cultivation of beans in Sierra Leone.
No. 12 The growing of root crops in Sierra Leone.
No. 13 The cultivation of cabbages and cauliflowers in Sierra Leone.

D—NJALA TRAINING COLLEGE

225. *Agricultural Course.*—The system whereby students undertake practical field work under the supervision of Agricultural Officers prior to entry into the Njala Training College is now well established. Of the twenty-one students recruited in 1954, eighteen completed their field course and entered the college in February, 1955, for their first study year. Eight students successfully completed the second year of their studies and entered upon the third and final year. One scholarship was withdrawn: the holder failing to fulfil requirements during the second year.

226. A further twenty-two students were awarded scholarships during the year and posted to field stations for practical work and experience. Two, of this latter intake, were awarded scholarships to be trained for the West African Institute for Oil Palm Research substation at Njala. Arrangements were made to retain two places for

Gambian students, who will enter the college in 1956 with those students successfully completing their practical field work.

227. Lectures and practical work continued as in previous years. The course of study included Agriculture, Surveying, Farm Implements and Machinery, Agricultural Chemistry, Zoology, Agricultural Botany, Farm Management, Anatomy and Physiology of Farm Animals, Nursery Practice, English, Arithmetic and Carpentry. There was the usual interchange of Education and Agricultural staff. Carpentry work received a setback due to the departure of the Manual Training Instructor.

228. Practical work in all branches of agriculture continued on established lines. The farm was extended on the usual system of strip cropping for sloping land, which has continued to be improved since the inception of the college. Briefly the system is one of contour strips; permanent tree crop alternating with annual crop strips. The latter are fallowed and cropped in rotation, and the former intercropped with pineapples and cassava. The citrus and pineapple crops are utilised in the students' mess, and annual crops—rice, maize and cassava—are utilised for feeding farm livestock, especially pigs.

229. A high standard of stock keeping was maintained and pigs, in particular, did well. Throughout the year, the students' mess was supplied monthly with a hog of 100 to 120 lb. liveweight. The production of food for their own consumption stimulated interest in pig-keeping as well as improving the students' diet. Other small stock, poultry, ducks and rabbits, were kept on a modest scale. Two of the cattle died from *Salmonella* infection and are to be replaced.

230. A Ransomes MG 6 tractor and range of implements arrived towards the end of the year. These and additional visual aids obtained from manufacturers have greatly facilitated teaching the principles and the use of farm machinery. A fuel store and implement shed were erected.

231. As in previous years, students visited departmental schemes and experimental stations. The second year students went on an extensive trek visiting Newton Experimental Farm, Rokupr Rice Research Station, Mechanical Cultivation centres and the Animal Husbandry Station at Musaia. These tours and visits to various departmental field activities, are considered essential in broadening the general background of the students' knowledge, and are appreciated by staff and students alike as advancing the educational standards of the students.

E—RESEARCH

Plant Pathology Section

232. Mr. F. C. Deighton, O.B.E., Plant Pathologist, proceeded on vacation leave on 8th January, prior to retirement from Sierra Leone. During Mr. Deighton's long tenure in office, Mycology and Systematic Botany have been placed on a firm footing and a large amount of information and data has been amassed. The very large number of collections of flowering plants and fungi made have been the basis of the two large departmental herbaria.

233. This section remained without an officer for the greater part of the year until Mr. C. T. Pyne returned from the United Kingdom and assumed duty as Plant Pathologist in September.

234. Duplicates of about 100 mycological collections were sent to the Commonwealth Mycological Institute and Kew herbarium.

235. The phanerogamic herbarium remained under the supervision of the Plant Pathologist in the absence of a Systematic Botanist-Ecologist.

236. A survey of some of the cacao farms in the Dama, Gaura and Tunkia chiefdoms in the Kenema District was carried out with a view to obtaining information on the incidence of " Black Pod " disease (*Phytophthora palmivora*).

237. A mycological analysis was made of soil samples collected from all the cacao farms visited with the object of finding out whether *Phytophthora palmivora* occurs in the soil. The fungi isolated did not include this or any species of economic importance but *Cunninghamella elegans* Ledner and *Fusarium solani* (Mart.) App. & Wr. were found to be common in the soils of all the farms. *Fusarium solani* is a new record for Sierra Leone.

238. A report of leaf spot on bananas in the Port Loko and Kambia districts is being investigated. It appears likely this is *Mycosphaerella musicola* (*Cercospora musae*), not previously recorded in Sierra Leone, which has come in from the banana plantations in French Guinea near by.

239. " A Vernacular Botanical Dictionary for Sierra Leone " and the revised " Diseases of Cultivated Plants in Sierra Leone " by Mr. F. C. Deighton, mentioned in last year's report, were placed for printing.

Agricultutal Chemistry Section

240. The Agricultural Chemist was on leave until April, when he resumed duty. The vacancy for one Laboratory Assistant was filled during the year and subordinate staff are now up to strength.

241. *Laboratory Investigations.*—The analysis of phosphorus, potassium, calcium, iron and manganese in plant material is now possible on a relatively large scale and numerous determinations were made, expecially on groundnut plants. Results were improved by the installation of an efficient drying oven and a ball-mill.

242. The analysis of soils continued in connection with work on fertilisers, but on a decreased scale, as it has been ascertained that there is little correlation between analytical results and fertiliser responses from the same soil. A number of soils were analysed for the Plant Pathologist in connection with a study of cacao ecology. Analyses of other materials, such as feeding stuffs, were carried out on request.

243. *Soil Fertility and Fertilisers.*—For several years this section of the Department has concentrated on the study of soil fertility problems. The value of superphosphate as a major fertiliser, required by almost all soils and crops in the country, is now firmly established and use of this fertiliser by farmers is becoming widespread. Confirmatory experiments continued at various sites throughout the country. Soil and plant analyses have proved of little value for predicting the optimum application rates of superphosphate, and it has now become routine practice to carry out simple field trials to determine the optimum dressings applicable in each locality. There is widespread

nitrogen deficiency in most soils but crops do not respond to nitrogenous fertilisers; this is being further investigated. Several soil types apparently have a just adequate level of potash.

244. *Maintenance of Fertility of Upland and Swamp Soils.*—This is a perpetual problem in all tropical countries where the rainfall is high and concentrated into peak periods. The problem is less acute in the swamp soils, but, under certain conditions leaching of soil nutrients may well occur and the problem must be investigated to determine its seriousness. It was with the latter in mind that the pot experimental work, started in previous years, was expanded to embrace swamp soils.

245. The dual approach outlined in the previous Annual Report continued, i.e., preliminary pot experiments, determining nutrient deficiencies of soils, followed by confirmatory field experiments and by mixed cropping experiments. The experiments and trials described hereafter indicate some of the results of progress made to date.

246. *Pot Experiments—Indicator Plants for Nutrient Deficiencies in Soils.*—A start was made to determine suitable indicator plants for revealing nutrient deficiencies in soils, using a procedure elaborated by Dr. R. A. Webb in the Gambia. Indicator plants were grown in equal volumes of soil contained in bituminised clay pots and watered with nutrient solutions. The soils used were analysed and it was assumed that maximum growth would occur when the plant was watered with a complete nutrient solution and that, if plants grew as strongly when watered with deficient solutions, then the soil contained adequate available reserves of the deficient element. In this trial, using macronutrient deficiencies only, maize, tomato and cabbage were tested for suitability as indicator plants. For phosphate deficiency all plants were satisfactory and growth differences were visible within forty days. For nitrogen deficiency, maize was most satisfactory, but cabbage was almost as good. Maize and tomatoes indicated potassium deficiency, but only in the later stages of growth; likewise these plants only revealed calcium and magnesium deficiencies at harvest time. Tomatoes did not prove generally satisfactory as indicator plants in view of their susceptibility to bacterial wilt and eelworm. Further experimental work is necessary to determine a range of satisfactory indicator plants; in the meantime, maize is being used tentatively to detect nitrogen and phosphate deficiencies.

247. *Pot Experiments—Nutrient Deficiencies in Various Soils as indicated by Plant Growth Responses.*—Using the premises indicated in the previously described experiment, a trial was laid down to determine macronutrient deficiencies of soils from three different vicinities. Results were obtained from the measured growth response of maize plants forty days after planting. The trial indicated the following deficiencies:—

(*a*) *Masimo Boliland Soil*—deficient in nitrogen, phosphorus and potassium.

(*b*) *Njala Upland Soil*—deficient in nitrogen, phosphorus, calcium and magnesium.

(*c*) *Newton Soil.*—deficient in nitrogen and phosphorus.

Field trials are now necessary to determine the quantity of fertiliser needed to rectify these deficiencies.

248. *Field Experiments on Groundnuts with Fertilisers, Njala.*—An experiment was laid down at Njala to confirm previous years' results that superphosphate, sulphate of potash and magnesium sulphate improve groundnut yields, and also to re-investigate the effects of lime and manganese sulphate. A factorial layout was used with four replications, seven treatment combinations being completely confounded with blocks to reduce the standard error. There were four plots per block. The site used was under upland rice in 1954 and gave a very poor and weedy crop. Dry season cultivations were unsuccessful in completely eradicating weeds and hand weeding was necessary throughout the growth of the groundnuts. The fertilisers, broadcast in all combinations, were:—

Mn	..	Manganese sulphate	56 lb./acre
Ca	..	Hydrated lime	1 ton/acre
K	..	Potassium sulphate ..	2 cwts./acre
P	..	Superphosphate	2 cwts./acre
Mg	..	Magnesium sulphate	2 cwts./acre

By far the best treatment was Ca.K.Mg., which gave a yield of 1,495 lb. of undecorticated fruit, compared with 500 lb. for no fertiliser. Lime greatly increased the shelling percentage, the number of kernels per fruit and the percentage of ovular cavities occupied by kernels. The effect of superphosphate was similar to that of lime, but to a lesser degree. It seems probable that this benefit was not due to the phosphate content, but to the calcium in the fertiliser, as a mixture of lime and superphosphate gave no greater increase in yield than either alone. When applied alone, potassium sulphate and magnesium sulphate had no effect on total yield, but considerably reduced the shelling percentage. When used in the presence of lime, both these fertilisers improved yields; they also interacted positively with superphosphate, but the effect was less noticeable.

249. Lime, sulphate of potash and magnesium sulphate can be recommended for fertiliser treatment of groundnuts at Njala. It remains to determine what the actual rates of application should be in order to obtain optimum economic return. In this experiment, however, the maximum profit was obtained from the KP treatment, in which the increased return due to fertilisers came to slightly more than £10 per acre, the cost of the fertiliser mixture being approximately £5 per acre.

250. *Field Experiments on Groundnuts with Trace Elements, Malal (Lophira Bush Area).*—As was mentioned in last year's report, the field experiment at Malal (Port Loko Circle), had not confirmed the responses to trace elements which had been discovered in preliminary pot trials. An experiment was laid down this year to test the same elements and block sizes were reduced as much as possible to eliminate the effects of soil heterogenity. The groundnuts, however, were again severely affected by rosette disease and, after four weeks growth, virtually every plant had succumbed and the experiment was abandoned. It is clear that it will be impossible to grow groundnuts on this site for several years.

251. *Mixed Cropping Experiment.*—This was started at Njala in 1952 and has been continued each succeeding year. The layout of the experiment was the same as in previous years and is reported in detail in the section of this report dealing with Njala Experimental Station. Results obtained were disappointing and soil fertility is being lost in

spite of the use of fertilisers. It is apparent that, in the earlier years of the experiment, the deep cultivation tapped a reserve of plant nutrients which has now been considerably reduced.

252. *Estimation of Rice Yields.*—The difficulties involved in obtaining reasonably accurate information regarding rice yields, especially in relation to mechanical cultivation sites, has initiated investigation into the evolution of a simple sampling technique. This year, more than a thousand sample yields were obtained from Bonthe, Makeni, Colony and Port Loko circles. Each sample represented one square yard of a farmer's plot chosen at random, harvested, and the volume of grain measured. The precision of sampling was calculated by carrying out test samples of crops of known yield from large representative areas, from the data acquired, a conversion factor was obtained to compute true yields from sample yields. The most important single factor in obtaining representative samples is the randomisation technique used and certain improvements will have to be made, in future, to reduce the personal bias factor at the time of sampling. Ideally, all sampling should be done by one, unbiased, individual. Preliminary analysis of data indicates that the majority of sampling results for the 1955 season were accurate to within 10 per cent of the actual crop harvested.

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253. As the officer who was to have taken up duties as Systematic Botanist/Ecologist could not be released from acting as officer in charge of the Rice Research Station, except for a few weeks, routine work was continued by the Plant Pathologist's staff. One Laboratory Assistant was attached to the Forestry Department's felling team at Kenema for several months to collect forest tree specimens. A collection of specimens of various species of *Rhaphia* was also made and sent to Kew to be used in the revision of the species in this genus, for the new "Flora of West Tropical Africa." This is an important genus in Sierra Leone as piassava, which is a major export crop, is obtained from certain species.

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